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\# 1565 File

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

February 6, 1989

Ms. Natalie Ellington
United States Environmental
Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Natalie:

Attached is a copy of our request for inclusion of the Dade East Plant on CERCLIS which was sent to Mr. Carlton on March 28, 1988.

While gathering information for the PA it was found that the site should be listed as Baxter Healthcare Corp. AKA: Dade East Plant. Our PA is titled Baxter Healthcare Corp. Please make this modification upon listing.

Please call if you need additional information.

Sincerely,

Brian M. Moore

Brian M. Moore
Environmental Specialist I
Bureau of Waste Cleanup

BMM/mlr

Attachment

accepted 9/18/89
NFRAP
DR.

BAXTER HEALTHCARE CORP.
AKA: DADE EAST PLANT
FLD132782046
PRELIMINARY ASSESSMENT

A. SITE DESCRIPTION. The site is a medical diagnostics laboratory and manufacturing plant [1,2]. The facility is located at 1851 Delaware Parkway, Miami, Dade County, Florida (Figs. 1 & 2) [1,2]. The company was incorporated in Florida on 4/10/67 [11], but the earliest record of on-site activities, on file, only dates back to 1973 [2].

B. DESCRIPTION OF HAZARDOUS CONDITIONS, INCIDENTS AND PERMIT VIOLATIONS. Prior to 1973, drums of trichloroethene (TCE), lacquer thinner, and paint solvents were stored along the northeast side of the main building, between the emergency generator and the cooling towers (Fig. 2, Locations 1 and 2) [2,9]. Some of the drums rusted through, leaking contents into the ground, before the area was cleared of these materials circa 1973 [2]. Also, in 1973, a piece of processing equipment known as a lyophilizer overheated, releasing TCE through an overflow vent onto the ground at the northernmost corner of the main building (Fig. 2) [2,10].

Follow-up sampling by an unnamed contractor hired by the facility in 1985 documented the TCE contamination in soil (107 ppm) and shallow groundwater (633 ppb in well WH) in the vicinity of the container storage area (Fig. 2) [10]. Related chemical breakdown products were also found in well WH (See Attachment A) [10].

Following the initial confirmation of groundwater contamination, the facility voluntarily hired Geraghty and Miller, Inc. to conduct a full investigation of the on-site contamination [9,10]. The results of the investigation show widespread contamination of shallow groundwater by TCE and its breakdown products. The plume apparently extends vertically to a depth of 35 ft. bls (below land surface) and horizontally beyond the border of the facility (Fig. 2) [9,10]. Furthermore, the study concurrently documents several clear violations of Primary Drinking Water Standards (PDWS) for TCE and vinyl chloride (Attachment A) [10]. At least 35 violations were recorded among monitoring well samples. Soil contamination has only been demonstrated in the vicinity of the container storage area [10].

Approximately 164 liters of Dowicide (2% solution of 2,4,5-trichlorophenol) have been stored on-site, but were apparently turned over to EPA quite recently [3,4,6,8].

C. RCRA STATUS. The faciity is an RCRA small quantity generator [3,4,6,7].

D. NATURE OF HAZARDOUS MATERIALS. Trichloroethene (TCE) is carcinogenic, and toxic by inhalation, direct contact, and ingestion. Potentially affected systems/organs include the respiratory and central nervous systems, the heart, the liver, and the kidneys [5].

1,2-dichlorethene exists as trans- and cis-isomers in equilibrium. Exposure can occur through inhalation, ingestion, and direct contact, subsequently acting as a local irritant, or systemically as a narcotic.

Acute exposure can result in dizziness, nausea, vomiting, intoxication resembling that resulting from alcohol intake, and possible transient renal effects [5].

1,1-dichloroethene is highly toxic via ingestion or inhalation. It also is spontaneously explosive. Experimentally, it is a mutagen, equivocal tumorigenic agent, carcinogen, and neoplastic agent [15].

Vinyl chloride is highly toxic, flammable, carcinogenic to humans, and experimentally shown to be neoplastic and an equivocal tumorgenic agent. Exposure can irritate skin and mucous membranes and affect the liver, brain, and hemato-lymphopoietic and central nervous systems. Ingestion, inhalation, and direct contact are potential routes of exposure [5,15].

2,4,5-trichlorphenol is moderately toxic via ingestion. Symptoms of acute exposure include decreased activity and motor skills, as well as onset of convulsive seizures. A 5% solution was reported to be mildly irritating to a few individuals. Carcinogenic determinations are indefinite thus far [5,15].

Toluene is an irritant to the skin, eyes, and respiratory tract. Chronic or prolonged exposure to skin can result in fissured dermititis. Contact with the eyes can cause irritation and reversible damage. Inhalation of high concentrations can affect the central nervous system, causing dizziness, headache, and fatigue, to collapse and coma [5]. The liver and kidneys can subsequently be affected. Occasionally, anemia is reported in association with acute or chronic exposures. Toluene is only slightly toxic by ingestion [5,15].

E. ROUTES OF CONTAMINATION. Surface water and air are potential routes of contamination. Groundwater is a known route of contamination [2,9,10].

F. POTENTIALLY AFFECTED POPULATION AND RESOURCES. Available evidence indicates that the sequence of on-site lithology consists of a 0-2 ft. thick upper mantle of Recent to Pliestocene sand and humus (Pamlico Sand), an underlying 100-110 ft. thick layer of permeable Pleistocene limestone and sandstone (Miami Oolite, Key Largo Limestone and Anastasia Formation), and a subjacent stratum of thick, low permeability Miocene marl and clay (Tamiami and Hawthorn Formations) [10,12].

The permeable strata, which extend from land surface to the top of the low-permeability marls of the Tamiami Formation, comprise the Biscayne aquifer. Unconfined, and therefore vulnerable to contamination, the Biscayne aquifer is the only source of potable groundwater in the Miami area [12].

The site is extensively paved, consequently providing the Biscayne aquifer with some protection against spilled contaminants. However, the confirmed occurrence of groundwater contamination on-site demonstrates the limited effectiveness of that protection. Low permeability clay lenses and clayey admixtures have also been identified among the upper geologic strata [10], but those materials are discontinuous and therefore unlikely to effectively limit the vertical migration of contaminants. Accordingly, on-site contamination has been documented to a depth of 35 ft. bls [10].

A storm drain, located near the lyophilizer-overflow spill, discharges into an underground sewer pipe running eastward across the site. Apparent reversible exchanges between the pipe and shallow groundwater, prevailing water levels in adjacent tidal waterways, and rainfall are responsible for locally variable patterns of shallow groundwater migration. Evidently, the predominant pattern of groundwater migration is characterized by groundwater divergence from the long axis of the stormwater pipe, although convergence toward that axis has been observed following a period of low rainfall [10].

The nearest potable well is located 3.24 miles northwest of the facility. That well is a component of the Miami Springs municipal wellfield at Miami Springs Country Club and is currently on standby status (Fig. 1) [13].

Any protection from contamination afforded by on-site pavement alternatively could promote the contamination of nearby surface waters. In addition, potential contaminants entering the stormwater drainage system are discharged into the Miami River. The Miami River and Tamiami Canal lie approximately 300 feet northeast and 700 ft. northwest of the site, respectively. Both water bodies are subject to estuarine conditions and neither is used as a source of potable water [10,14]. The highly urbanized nature of these waterways logically precludes categorization of downstream waterways as sensitive environments (Fig. 1).

G. <u>RECOMMENDATIONS AND JUSTIFICATION</u>. Widespread contamination of the Biscayne Aquifer by spilled TCE and its breakdown products was documented [9,10]. However, no potable wells are within 3 miles of the site and nearby urbanized waterways lack potable intakes and sensitive environments [14]. Although municipal wells are within 4 miles of the site, regional groundwater migration patterns favor movement away from the wells (Fig. 1) [10,12]. Furthermore, the facility is currently proceeding with a contamination abatement program, in cooperation with Dade County Environmental Resource Management [9,10]. Therefore, a No Further Action priority for CERCLA site inspection is recommended.

ATTACHMENT A
SITE INSPECTION SUMMARY

FLD

SITE NAME: BAXTER HEALTHCARE, INC.
AKA: DADE EAST PLANT

Date (Agency)	Sample Type	ANALYSIS VOC	SVOC	P/P	MET	Comments: All concentrations in ug/l unless otherwise noted
1985 (Baxter)	GW	X				Monitoring wells WC, WD, WE, WF (unknown depths), WI, WJ, WK, WL (10 ft. bls) and WH (14 ft. bls) were installed and sampled. TCE (633), t-1,2-dichloroethene (871) and 1,1-dichloroethene (1.8) were found in well WH. Lower concentrations of the latter 2 contaminants were found in WC, WD, WE, and WF [10].
	SL	X				Soil from the container storage area contained TCE (107 ppm) [10].
06/26/87 - 07/02/87 (Amdrill)						Monitoring wells 1S, 3S, 4S, 5S, 6S (screened 6-13 ft. bls), 2D and 7D (screened, 30-35 ft. bls) were installed [10].
06/27/87 - 07/02/87 (G&M)	SL	X				An uncalibrated, total ionization potential (TIP) air analyzer was used to screen soil samples to determine future sampling locations. Ionizible organics were found in wells 2D, 3S, 4S, 5S, 6S, and 7D, but not in well 1S [10].
07/21-22/87	GW	X				Water levels in wells were measured and groundwater samples were collected. 1,2-dichloroethene (220), TCE (280), vinyl chloride (15), chloroform (21), and methylene chloride (74) were detected in groundwater samples. The latter 2 compounds are potentially laboratory contaminants [10].
08/28/87 (G&M)	GW					Water levels were measured in monitoring wells [10].
04/11-26/88 (G&M)	SL	X				Soil samples were screened, using a calibrated TIP meter to identify future sampling sites [10].
04/13-26/88 (Amdrill)						Wells 13D (screened 27-32 ft. bls), 10S, 11S, 12S, 14S, and 15S (screened 6-13 ft. bls) were installed [10].
04/28-29/88 (G&M)	GW	X				Static water level, chloride content, and (uncalibrated) conductivity was determined for each of several monitoring wells. TCE (30,000), vinyl chloride (23), and t-1,2-dichloroethene (310) were found in several monitoring wells.
	ST					Stormwater drainage, apparently influencing groundwater migration, also was measured for conductivity [10].

ATTACHMENT A
SITE INSPECTION SUMMARY

FLD

SITE NAME: BAXTER HEALTHCARE, INC.
AKA: DADE EAST PLANT

Date (Agency)	Sample Type	ANALYSIS VOC	SVOC	P/P	MET	Comments: All concentrations in ug/l unless otherwise noted
05/11/88 (G&W)	GW	X				Well 1S was resampled due to an extremely high level of contamination by TCE (30,000) on 4/28-29/88. Subsequent analysis revealed TCE (25,000), t-1,2-dichloroethene (300) and vinyl chloride (3) in the 1S sample [10].
04/14/88	SL	X	X		X	Soil samples were collected from Locations I, II, and III and submitted for chromium, silver, arsenic, barium, cadmium, selenium, purgeable organics, xylene, and VOCs [10]. Only samples from Location II (the container storage area) contained detectable concentrations of any parameter tested. Toluene (27) and TCE (6) were found in that sample [10].

Key: Sample Types: GW = Groundwater
SD = Sediment
SL = Soil
SW = Surface Water
ST = Stormwater

Agency: G&M = Geraghty & Miller, Inc.

BAXTER HEALTHCARE CORP.
AKA: DADE EAST PLANT

References

Reference Number	Description of Reference

1. Southern Bell. 9/88. Telephone Directory.
2. Savard, E. 10/26/87. Letter to Twachtmann.
3. Johnson, J. 5/13/88. Letter to Savard (2/4/88 memo attached).
4. Savard, E. 1/7/88. Letter to Wierzbicki (1/20/86 letter attached).
5. Sittig, M. 1985. Handbook of Toxic and Hazardous Chemicals and Carcinogens, Second Edition. Noyes Publications, Park Ridge, New Jersey.
6. Legel, A. F. 7/26/88. Letter to A. Pavda (7/14/88, 7/25/88 (2), and 7/27/88 letters attached).
7. FDER. 2/11/88. Hazardous Waste Compliance Monitoring Enforcement Log.
8. Moore, B. 11/8/88. Conversation record.
9. Geraghty & Miller, Inc. 2/88. Contamination Assessment Plan (CAP).
10. Savard, E. 6/10/88. Letter to D. Smith (Geraghty & Miller CAR attached).
11. Feeny, C. 11/30/88. Conversation record.
12. Schroeder, M. C.; H. Klein, and N. D. Hoy. 1958. Biscayne Aquifer of Dade and Broward Counties, Florida. FGS/USGS RI No. 17.
13. McCarthy, J. 11/17/88. Conversation Record (2/15/83 memo attached).
14. Healy, H. 1977. Public Water Supplies of Selected Municipalities in Florida, 1975. USGS WRI 77-53.
15. Sax, N. I. 1984. Dangerous Properties of Industrial Materials, Sixth Edition. Van Nostrand Reinhold Co., New York.

EPA	POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT PART 1 - SITE INFORMATION AND ASSESSMENT	IDENTIFICATION 01 STATE: FL 02 SITE NUMBER: D132782046

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common or descriptive name of site) Baxter Healthcare Corp. AKA: Dade East Plant [1,2]	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER 1851 Delaware Parkway
03 CITY Miami	04 STATE: FL; 05 ZIP CODE: 33152-0672; 06 COUNTY: Dade; 07 COUNTY CODE: 025; 08 CONG DIST: 16
09 COORDINATES LATITUDE 25° 47' 03.0" LONGITUDE 080° 14' 43.0"	(Fig. 1)

10 DIRECTIONS TO SITE (Starting from nearest public road)
Take SR 836 to N.W. 27th Ave. Follow N.W. 27th Ave. northward to NW 17th. Turn west on N.W. 17th St. and veer right onto Delaware Parkway. The site is located north of the next cross-street (Fig. 1).

RESPONSIBLE PARTIES

01 OWNER (If known) Wilbur H. Gantz, President [11]	02 STREET (Business, mailing, residential) P.O. Box 520672 [2]
03 CITY Miami	04 STATE: FL; 05 ZIP CODE: 33152-0672; 06 TELEPHONE NUMBER: (305) 633-6461 [1]
07 OPERATOR (If known and different from owner)	08 STREET (Business, mailing, residential)
09 CITY	10 STATE; 11 ZIP CODE; 12 TELEPHONE NUMBER ( )

13 TYPE OF OWNERSHIP (Check one)
_X_ A. PRIVATE __ B. FEDERAL: ____________ (Agency Name) __ C. STATE __ D. COUNTY __ E. MUNICIPAL
__ F. OTHER: ____________ (Specify) __ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
__ A. RCRA 3001 DATE RECEIVED: __/__/__ (MONTH DAY YEAR) __ B. UNCONTROLLED WASTE SITE (Cercla 103 c) DATE RECEIVED: __/__/__ (MONTH DATE YEAR) _X_ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
_X_ YES DATE __/__/__ (MONTH DAY YEAR)
__ NO
(See Attachment A)

BY (Check all that apply)
__ A. EPA __ B. EPA CONTRACTOR __ C. STATE __ D. OTHER CONTRACTOR
__ E. LOCAL HEALTH OFFICIAL __ OTHER: Geraghty & Miller (Specify)
CONTRACTOR NAME(S): ____________

02 SITE STATUS (Check one)
_X_ A. ACTIVE __ B. INACTIVE __ C. UNKNOWN

03 YEARS OF OPERATION
Unknown (BEGINNING YEAR) | Present (ENDING YEAR) _X_ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED:
TCE, 1,2-dichloroethene, 1,1-dichloroethene, chloroform, methylene chloride, vinyl chloride, toluene, 2,4,5-trichlorophenol [2,3,5,6,9,10].

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION:
The site is more than 3 miles from the nearest wellfield (Fig. 1) [13]. Adjacent surface water bodies are urbanized and not used for potable supplies (Fig. 1) [14].

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 3-Description of Conditions
__ A. HIGH (Inspection required promptly) __ B. MEDIUM (Inspection Required) __ C. LOW (Inspect on time available basis) _X_ D. NONE (No further action needed, complete disposition form)

VI. INFORMATION AVAILABLE FROM

01 Contact	02 OF (Agency Organization)			03 Telephone Number
Eric S. Nuzie	FDER/BWC			(904)488-0190
04 Person Responsible for Assessment	05 Agency	06 Organization	07 Tel. No.	08 Date
Craig Feeny	FDER	BWC	(904)488-0190	12/23/88 (Mo. DAY YEAR)

EPA FORM 2070-12(7-81)

HAZARD RANKING SYSTEM SCORING SUMMARY

FOR

BAXTER HEALTHCARE CORPORATION
EPA SITE NUMBER FLD
MIAMI
DADE COUNTY, FL
EPA REGION: 4

SCORE STATUS: IN PREPARATION

SCORED BY CRAIG FEENY
OF FDER
ON 12/29/88

DATE OF THIS REPORT: 01/01/80
DATE OF LAST MODIFICATION: 01/01/80

GROUND WATER ROUTE SCORE	:	11.30
SURFACE WATER ROUTE SCORE	:	0.00
AIR ROUTE SCORE	:	0.00
MIGRATION SCORE	:	6.53

HRS GROUND WATER ROUTE SCORE

CATEGORY/FACTOR		RAW DATA	ASN. VALUE	SCORE	
1. OBSERVED RELEASE		YES	45	45	(Ref.9,10)
2. ROUTE CHARACTERISTICS					
DEPTH TO WATER TABLE					
DEPTH TO BOTTOM OF WASTE					
DEPTH TO AQUIFER OF CONCERN					
PRECIPITATION					
EVAPORATION					
NET PRECIPITATION					
PERMEABILITY					
PHYSICAL STATE					
TOTAL ROUTE CHARACTERISTICS SCORE:				N/A	
3. CONTAINMENT				N/A	
4. WASTE CHARACTERISTICS					
TOXICITY/PERSISTENCE:ASSIGNED VALUE,15				15	(Ref.10) (Re-.5,15)
WASTE QUANTITY	CUBIC YDS	0			
	DRUMS	2 (Ref.2,10)			
	GALLONS	0			
	TONS	0			
	TOTAL	1 CU. YDS	1	1	
TOTAL WASTE CHARACTERISTICS SCORE:				16	
5. TARGETS					
GROUND WATER USE			3	9	(Ref.12)

AND	MATRIX VALUE	0	0	(Ref.14)
TOTAL POPULATION SERVED	10001 PERSONS			
NUMBER OF HOUSES	0			
NUMBER OF PERSONS	10001			
NUMBER OF CONNECTIONS	0			
NUMBER OF IRRIGATED ACRES	0			
TOTAL TARGETS SCORE:			9	

GROUND WATER ROUTE SCORE (Sgw) = 11.30

SITE: BAXTER HEALTHCARE CORPORATION

HRS SURFACE WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE	
1. OBSERVED RELEASE	NO	0	0	
2. ROUTE CHARACTERISTICS				
SITE LOCATED IN SURFACE WATER	NO	(Fig.1)		
SITE WITHIN CLOSED BASIN	NO	(Fig.1)		
FACILITY SLOPE	0.0 %	(Fig.1)		
INTERVENING SLOPE	0.0 %	0	0	
24-HOUR RAINFALL	4.5 INCHES	3	3	(Ref.16)
DISTANCE TO DOWN-SLOPE WATER	300 FEET	3	6	(Fig.1)
PHYSICAL STATE	3		3	(Ref.2,10)
TOTAL ROUTE CHARACTERISTICS SCORE:			12	
3. CONTAINMENT	3		3	(Ref.2,9,10)
4. WASTE CHARACTERISTICS				
TOXICITY/PERSISTENCE:ASSIGNED VALUE,15			15	(Ref.10) (Ref.5,15)
WASTE QUANTITY CUBIC YDS	0			
DRUMS	2	(Ref.2,10)		
GALLONS	0			
TONS	0			
TOTAL	1 CU. YDS	1	1	
TOTAL WASTE CHARACTERISTICS SCORE:			16	
5. TARGETS				
SURFACE WATER USE		0	0	
DISTANCE TO SENSITIVE ENVIRONMENTS		0	0	(Fig.1)
COASTAL WETLANDS	NONE			

DISTANCE TO STATIC WATER	) 3 MILES	(Fig.1)	
DISTANCE TO WATER SUPPLY INTAKE	) 3 MILES	(Fig.1)	(Ref.14)
AND	MATRIX VALUE	0	0
TOTAL POPULATION SERVED	0		
NUMBER OF HOUSES	0		
NUMBER OF PERSONS	0		
NUMBER OF CONNECTIONS	0		
NUMBER OF IRRIGATED ACRES	0		

TOTAL TARGETS SCORE: 0

SURFACE WATER ROUTE SCORE (Ssw) = 0.00

SITE: BAXTER HEALTHCARE CORPORATION

HRS AIR ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	NO	0	0

2. WASTE CHARACTERISTICS

REACTIVITY: MATRIX VALUE

INCOMPATIBILITY

TOXICITY

WASTE QUANTITY CUBIC YARDS
DRUMS
GALLONS
TONS

TOTAL

TOTAL WASTE CHARACTERISTICS SCORE: N/A

3. TARGETS

POPULATION WITHIN 4-MILE RADIUS
0 to 0.25 mile
0 to 0.5 mile
0 to 1.0 mile
0 to 4.0 miles

DISTANCE TO SENSITIVE ENVIRONMENTS
COASTAL WETLANDS
FRESHWATER WETLANDS
CRITICAL HABITAT

DISTANCE TO LAND USES
COMMERCIAL/INDUSTRIAL
PARK/FOREST/RESIDENTIAL
AGRICULTURAL LAND
PRIME FARMLAND
HISTORIC SITE WITHIN VIEW

AIR ROUTE SCORE (Sa) = 0.00

HAZARD RANKING SYSTEM SCORING CALCULATIONS PAGE 5
FOR
SITE: BAXTER HEALTHCARE CORPORATION
AS OF 01/01/80

GROUND WATER ROUTE SCORE

OBSERVED RELEASE		45
WASTE CHARACTERISTICS	X	16
TARGETS	X	9

= 6480 /57,330 X 100 = 11.30 = S1gw

SURFACE WATER ROUTE SCORE

ROUTE CHARACTERISTICS		12
CONTAINMENT	X	2
WASTE CHARACTERISTICS	X	16
TARGETS	X	0

= 0 /64,350 X 100 = 0.00 = S1sw

AIR ROUTE SCORE

OBSERVED RELEASE 0 /35,100 X 100 = 0.00 = S1air

SUMMARY OF MIGRATION SCORE CALCULATIONS

	S	S02
GROUND WATER ROUTE SCORE (S1gw)	11.30	127.69
SURFACE WATER ROUTE SCORE (S1sw)	0.00	0.00
AIR ROUTE SCORE (S1air)	0.00	0.00

√ (SO2igw + SO2isw + SO2iair)	11.30
SIM = √ (SO2igw + SO2isw + SO2iair)/1.73	6.53

OVERSIZED

DOCUMENT

MAP

Reference 1

Southern Bell®

BELLSOUTH Company

Baxter Healthcare
Corp., Dade East
Plant.

Yellow Pages

Florida International University
The State University of Florida at Miami

reater Miami

iding Perrine and North Dade

tember 1988-89

A-K

White and Yellow Pages

ıard S 596-2520
MGARDNER AUTO TAG
GENCY INC 1375 NW 36th St 638-8000
ardner E G 7925 SW 86th St 279-4211
ardner E S 62 NE 10th St MShrs 759-9678
ardner H S 15151 NE 12th Av NMB 945-4753
artel Bruce 10300 SW 49th St 595-5241
artel John 15254 SW 103rd Av 251-4598
artel S L 9710 Hammocks Blvd 387-3876
arten A E 6844 Harding Av MB 865-7352
garten Abraham
0 Sans Souci Blvd NM 891-7709
garten Alan & Weslee
20 SW 115th St 238-3246
garten Alyssa M atty 1221 Brickell Ave 579-0832
garten David 2500 NE 135th St NM 945-6064
garten Douglas L 11501-D SW 109th Rd 271-0661
garten Jack A 18950 NE 20th Ct NMB 932-4698
garten James A 2825 Jefferson St 858-6099
garten Lang 3924 Hardie Rd 663-1652
garten Maurice 4301 Collins Av MB 534-9335
garten Maurice J atty
outheast Financial Center 358-5100
garten Michael 445 NE 195th St 651-3978
garten S Barnard 2999 Point East Dr 931-4263
garten Shirley 250 174th St 932-8147
garten V H 7261 SW 52nd Ct 661-1117
garten William 12823 SW 112th Pl 253-3252
gartner A 8400 Byron Av MB 864-3687
gartner Brad 14824 SW 124th Ct 233-5517
gartner Esther 16401 SW 142nd Av 255-2106
gartner Gary L 2927 Shipping Av 446-6905
gartner J 13947 SW 84th St 385-2025
gartner M F 17001 SW 112th Av 235-6079
gartner Maria & Watson
895 NE 18th Av NM 949-5641
gartner R F 5291 SW 127th Av 554-8459
gartner S 224 Madeira Av CG 448-8384
gartner S C 1809 Brickell Av 854-7148
gartner Watson & Maria
895 NE 18th Av NM 949-5641
ler L George 7625 Abbott Av MB 864-8206
noehl Alvin 18635 NE 20th Ct NMB 932-9848
nohl C 1401 NE 191st St 945-2137
nohl Robert 16701 NE 13th Av 947-1803
nohl S Peter 300 Bayview Dr 949-0939
nrind Ray 1000 Quayside Ter 895-0590
nrind Sherman 1000 Quayside Ter 895-4426
nshlag Stanley 100 Kings Point Dr 945-7415
nstark Charles R 13842 Kendale Lakes Dr 385-2953
nstein S H 9248 Dickens Av Surfside 864-3308
mwald Gertrude & Sol
0410 SW 142nd Av 387-2151
n Nick 135 Curtiss Pkwy MSpgs 887-1766
George J 3920 SW 6th St 443-7384
r Hart 13745 SW 149th Circle Ln 238-6145
Judith Hope 10975 SW 107th St 274-9007
Marie 100 Kings Point Dr 945-4307
r Thomas 9952 SW 122nd St 238-8133
UR THOMAS atty
00 N Biscayne Blvd 377-3561
r Werner A 426 Majorca Av CG 444-4108
ra Nil R MD 9727 SW 106th Ter 279-8637
reis Christel 14730 Breckness Pl 822-9159
sa Rosa 42 E 11th St Hlh 883-0018
USCH & LOMB-LAMEX
400 NW 19th St 477-0070
sch Louis P 8441 SW 16th St 264-5902
sell Billie M 4260 SW 102nd Av 221-2781
ser Joseph J 155 Ocean Lane Dr Key Bisc 361-5928
ser Stephen S 800 S Dixie Hwy CG 661-3882
sher Cathy 235 Sidonia Av CG 443-7503
stein Ernest Dr 3625 N Country Club Dr 932-8759
stein F 3701 N Country Club Dr 932-3688
ta Body Shop 4624 E 10th Ct Hlh 685-9278
ta Carmen 11177 SW 88th St 270-1785
ta F M 5701 SW 50th Ter 666-1612
ta Juan F 4707 NW 7th St 443-7482
ta Lidio 11301 SW 43rd Ter 226-0379
ta Lidio 691 W 29th St Hlh 885-1135
ta Maria 660 SW 9th St 856-8795
ta Miguel 530 Ragan Dr MSpgs 884-0755
ta Miguel J 46 Suffolk Av Hlh 884-0962
ta Nelson 1875 NE 154th St NMB 945-9767
ta Nicia 874 E 22nd St Hlh 693-3852
ta Rolando 1006 8th St MB 531-5242
ta Vicente 422 E 33rd St Hlh 691-5470
ta Vicente 422 E 33rd St Hlh 836-8684
te Antonio 70 W 31st St Hlh 885-3109
te Lazaro 18475 SW 204th St 233-8518
a Jorge 243 E 8th St Hlh 884-0014
ista Alci 5450 NW 181st Ter 620-0363
ista Andrea Mrs 619 SW 7th Av 854-6219
ista Angela S 6450 W 27th Way Hlh 362-5762
ista Angelina 15522 SW 123rd Av 238-0487
ista Arguello 830 9th St MB 532-0241
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Miami General Employees Association-Local 1907 AFSCME 4011 W Flagler St - 643-2254
Miami Theatrical Stage & Motion Picture Studio Employees I A T S E Local 545 1190 NE 125th St NM ---------- 895-0025

MIAMI TYPOGRAPHICAL UNION
---------- **871-1605**

Motion Picture Projectionists & Sound Technician Local 316 IATSE 101 Westward Dr MSpgs ---------- 883-6121
Motion Picture Studio Mechanic Local 477 IATSE 1035 NE 125th St NM ---------- 893-8585
Musicians Union Local 655 A F Of M 1779 NW 28th St ---------- 633-3235
NABET Local 15 AFL-CIO ---------- 868-6658
National Association Of Letter Carriers Branch 1071 70 NE 39th St ---------- 576-0464
National Federation Of Federal Employees Local 1453 1201 NW 16th St ---------- 325-9437
National Post Office Mailhandlers Local 318 625 NE 131st St NM ---------- 895-7564

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15490 NW 7th Av ---------- **688-2545**

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Plumber's Local No 519 Federal Credit Union 2409 NW 17th Av ---------- 635-4809

PLUMBERS LOCAL UNION NO 519
Main Office 2409 NW 17th Av ---------- **635-4571**
Financial Secretary 2409 NW 17th Av -- **635-4572**

Roofers Local Union No 57 4349 NW 36th St MSpgs ---------- 885-9759
Sanitation Employees Association 1400 NW 36th St ---------- 638-8283
Screen Actors Guild 2299 Douglas Rd ---------- 444-7677

SCREEN EXTRAS GUILD
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Sheet Metal Workers Local No 32 20375 NE 15th Ct ---------- 651-5971
South Florida AFL-CIO 4090 Laguna St CG ---------- 444-2499

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Southern Conference Of Teamsters 1250 Hallandale Beach Blvd Hallandale ---------- Miami Tel No-- 947-8086

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See Baxter Health Care Corp Of Dade Division

BAXTER HEALTH CARE CORP OF DADE DIVISION
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---------- 262-9989

...TICS ASSOCIATES OF MIAMI
...245 SW 87th Av ---------- **595-0126**
... Clinical Laboratory
...1790 Coral Way ---------- 856-1916
...th Imaging Group The
...930 SW 40th St ---------- 552-3171
...th Testing Centers
...240 NE 163rd St NMB ---------- 947-0707
(Please See Our Display Ad Page 1244
... Medical Lab 2891 W 2nd Av Hlh --- 887-6277
...ch Vascular Systems Inc
...815 Coral Way ---------- 262-6851

...OPATH
...cology & Immunology Laboratories
Scientific Director-Ronald Paul PHD
...00 W 20th Av Hlh ---------- **362-7287**

...ER-AMERICAN LABORATORY SERVICE
...00 SW 87th Ct ---------- **270-1717**
...rt Medical Center
...0 North Miami Beach Blvd NMB ---------- 945-1545
...all Medical Laboratory
...00 Douglas Rd CG ---------- 442-0800
(Please See Our Display Ad Page 1244)

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...63 S Miami Av ---------- **285-1720**
...C Non-Invasive Vascular Lab
...90 NW 95th St ---------- 696-3330

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MIAMI BEACH
Pregnancy - Reference Testing
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...668 Meridian Av MB ---------- 538-1...24

...al Imaging Of Miami
...00 SW 8th St ---------- 262-...
...al Imaging Of Miami Inc
...00 SW 8th St ---------- 262-...
...al Tool Co 1175 NE 125th St NM ---------- ...-8328
...ore Inc 2201 W 76th St Hlh ---------- 558-4000

...PATH
...4 Meridian Av Miami Beach ---------- 5...-9529
...l Medical Laboratories Inc
... SW 12th Av ---------- ...-7330
...n Labs Inc 9507 SW 160th St ---------- ...-5524

... DIAGNOSTIC AND TRANSPORTATION

56...
...th ...
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4168 W...
Tomedic...
...TRAS...

Dade Division

Baxter Healthcar
P.O. Box 520672
Miami, Florida 3:
West 305.592.2311
Telex 441295

Reference 2

Reference 2

Baxter

RECEIVED OCT 28 1987 DIVISION OF ENVIRONMENTAL OPERATIONS

October 26, 1987

Mr. Dale Twatchtmann
Department of Environmental Regulations
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Twatchtmann:

Recently Baxter Healthcare Corporation, Dade Division (Dade) engaged a consulting firm to conduct a study of the ground and subsurface waters at our Dade East plant located at 1851 Delaware Parkway, Miami, Florida. Preliminary results of the study indicate some contamination of the subsurface waters with various levels of trichloro ethylene and its isomers.

To the best of our knowledge, there has not been any recent spill of these materials. However, drums of trichloro ethylene, lacquer thinner and paint solvents had at some time been stored outside along the building unprotected from the elements. Some of these drums rusted through and the contents leaked into the ground. The area was cleared of these materials about 1973. Additionally, in 1973 a piece of processing equipment known as a lyophilizer overheated releasing trichloro ethylene on the ground at the west end of the building.

At this time we cannot say whether the groundwater contamination we have found was caused by Dade, but our initial findings and based on the site history, we have requested our consultants to provide us with a proposal and timetable to more fully delineate the extent of the problem. This delineation must be completed before any remedial action plan can be developed. Any remediation efforts which Dade might choose to undertake would, of course, be submitted to the responsible Florida Pollution Control agencies for prior review and approval.

We plan to continue pursuing this matter and to report back to you regarding our progress. Hopefully we will be in a position to have a meeting with personnel of your office within 30 days.

Sincerely,

Edward Savard

Edward Savard, Ph.D.
Director
Safety and Environmental Affairs

RECEIVED OCT 28 1987

ES:vc

RECEIVED Office of the Secretary NOV 3 1987

BUREAU OF OPERATIONS

Send to
[illegible]
[illegible]

Dade Division

Baxter Healthcare Corporation
P.O. Box 520672
Miami, Florida 33152-0672

Baxter

Mr. Dale Twatchtmann
Department of Environmental Regulations
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

CERTIFIED
No. 545999
MAIL

Reference 3

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

No 109

SOUTHEAST FLORIDA DISTRICT
1900 SOUTH CONGRESS AVENUE, SUITE A
WEST PALM BEACH, FLORIDA 33406
(305) 964-9668

BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY
J. SCOTT BENYON
DISTRICT MANAGER

MAY 13 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

RECEIVED
JUN 7 1988
HAZARDOUS WASTE

Edward Savard, Ph.D.
Director
Safety and Environmental Affairs
Baxter Healthcare Corporation
Post Office Box 520672
Miami, Florida 33152-0672

Dear Dr. Savard:

RE: Dowicide (2,4,5-Trichlorophenol)

The Department has completed review of your April 14, 1988 letter regarding the chemical product Dowicide.

Be advised that the State of Florida is not obligated through agreement with the United States Environmental Protection Agency (EPA) to accept this material.

In the immediate future, we suggest that you contact the EPA at the following address:

United States Environmental Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Should you have further questions for the District, please contact Mr. Paul Wierzbicki at telephone 407/964-9668.

Sincerely,

Janet A. Johnson

Janet A. Johnson
Enforcement Manager

JAJ:paw/162

cc: Office of General Counsel, DER, Tallahassee
James Scarbrough/EPA Region IV, Florida RCRA Activities, Atlanta
File, Reporting Coordinator
Mara Austin, Metro-Dade Environmental Management
West Palm Beach DER files

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

FOR ROUTING TO OTHER THAN THE ADDRESSEE

To:	Loctn:
To:	Loctn:
To:	Loctn:
From:	Date:

MEMORANDUM

TO: Raoul Clarke, DER, Tallahassee

FROM: PW Paul Alan Wierzbicki, SEFD Hazardous Waste Compliance

DATE: February 4, 1988

SUBJECT: Request From Baxter Healthcare to Store Acutely Toxic Waste Beyond the 180 Day Accumulation Time Limit for Small Quantity Generators of Hazardous Waste

---

On January 8, 1988, this office received a request from Dr. Edward Savard, Ph.D. (Director, Safety and Environmental Affairs) Baxter Healthcare Corporation, Dade Division, 1851 Delaware Parkway, Miami, Florida 33125, telephone 305/633-6461, regarding the on-site accumulation of hazardous waste. Specifically, Dr. Savard requested an extension of the 180 day accumulation time limit for small quantity Generators of Hazardous waste for about five pounds of trichlorophenol (F027.) A copy of his request is enclosed. On January 20, 1988, the SEFD granted a 30-day extension for the 180-day limit. A copy of our letter is also enclosed.

Since the waste is listed for acute toxicity, we were incorrect in allowing the 30-day extension from the 180 day-time limit. (We should have only allowed 30 days from the 90 day limit for SQG's storing greater than one kg of acutely toxic waste listed in 40 CFR 261.31).

Title 40 CFR Part 261.5 (e) requires SQG's to meet the requirements of 40 CFR 260-266 as well as the permitting requirements if the acutely toxic waste is to be stored on-site greater than 90 days.

RECEIVED
FEB 11 1988
HAZARDOUS WASTE

Memo to Raoul Clark
February 4, 1988

Dr. Savard claims that there are no facilities currently available for the disposal of this material and he seeks to permanently store the waste on site until a treatment or disposal facility is found. We have informally checked on this, and no facility could be found by telephone.

On January 26, 1988, I telephoned Dr. Savard and asked him for a list of the TSD's he has contacted, and a description of how the waste is to be stored on-site.

Your direction on this is requested.

PAW/119

cc: West Palm Beach DER files
File, Monthly Logs

Dade Division

Miami, Florida 33152 [redacted]

Reference 4

Baxter

January 7, 1988

Department of Environmental Regulations
Hazardous Waste Management Program
1900 South Congress Avenue, Suite A
West Palm Beach, Florida 33406

Attention: Mr. Paul Wierzbicki

Ref.: Baxter Healthcare Corporation
Dade Division
1851 Delaware Parkway
Miami, FL 33125
EPA No. FLD007854359

Dear Mr. Wierzbicki:

We have been advised by Mr. Paul Parsons of the U.S. EPA office in Washington, D.C. and Mr. M. Redig in Tallahassee, Florida, to contact your office to obtain an exemption from the 180 day rule for Small Quantity Generators [40 CFR 261.5, 262.34(d)-(f)] regarding the disposal of trichlorophenol (TCP), F027. This is required in order to store the material by a Small Quantity Generator without a storage permit.

As you are aware, there are no approved transporters or disposal sites in the U.S. approved to handle TCP, making it impossible to comply with 40 CFR 261.5(g)(3) of the regulations. We request a letter of exemption for this item allowing for indefinite storage in our hazardous waste area until such time that an approved disposal site becomes available. The inventory of TCP will be less than 5 lbs.

Thank you for giving this matter your immediate attention.

Sincerely,

Edward Savard

Edward Savard, Ph.D.
Director
Safety and Environmental Affairs

ES:vc

FILE

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

SOUTHEAST FLORIDA DISTRICT
1900 SOUTH CONGRESS AVENUE, SUITE A
WEST PALM BEACH, FLORIDA 33406
(305) 964-9668

BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY
J. SCOTT BENYON
DISTRICT MANAGER

JAN 20 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Dr. Edward Savard, Ph.D.
Director, Safety and Environmental Affairs
Baxter Healthcare Corporation, Dade Division
1851 Delaware Parkway
Miami, Florida 33125

Dear Dr. Savard:

RE: Your Request for Extension of the 180 day Maximum Accumulation Requirement Received January 8, 1988.

The Department acknowledges receipt of your request for an extension of the 180 day maximum accumulation time limit for small quantity generators of hazardous waste. Title 40 CFR 262.34 allows the Department to grant an extension of the 180 day time limit "due to unforeseen, temporary and uncontrollable circumstances." The regulation allows the Department to grant an extension of up to thirty (30) days. In considering your request, the Department hereby allows the thirty day extension. You must properly manifest the accumulated waste off-site to a permitted hazardous waste treatment, storage or disposal facility within 210 days following the date originally designated as the accumulation start date.

Manifest records must be kept in good order for inspection and verification purposes. Please be advised that disposal costs are not justification for allowing the extension. This extension is not to be applied to any other waste streams nor for future hazardous waste generation.

Should you have questions, please contact Mr. John Petronio at telephone 305/964-9668.

Sincerely,

Janet A. Johnson

Janet A. Johnson
Enforcement Manager

JAJ:jpd:197

cc: Office of General Counsel, DER, Tallahassee
Metropolitan Dade County Environmental Resources Management
Charlie Biedermann, DER, Tallahassee
File Reporting Coordinator
DER files

Reference 5

HANDBOOK OF TOXIC AND HAZARDOUS CHEMICALS AND CARCINOGENS

Second Edition

by

Marshall Sittig

Princeton University

dent and Managing
emical and Process
th E.I. Du Pont de
ıring, Ethyl Corpo-
and Princeton Uni-
ıs.

NOYES PUBLICATIONS

Park Ridge, New Jersey, U.S.A.

Reference 6

OZONICS RECYCLING C
The Atrium Financial Center-Suite 404
1515 N. Federal Highway
Boca Raton, FL 33432
(407) 395-9505

For Your Baxter Files re: Disposal of F027

July 26, 1988

Dr. Alex Padva
Dept. of Environmental Regulation
1900 So. Congress Ave.
West Palm Beach, Florida 33406

Dear Alex,

Please find enclosed copies of my correspondence relative to the "Dowicide" at Baxter Health Care in Miami.

Should the Atlanta EPA make a sample available or locate a parallel situation for us we will let you know. If you should come across anything that might lead to a pilot on "Dowicide" or any other toxic. Please call upon us.

Respectfully,

Allen F. Legel

Allen F. Legel
CEO

RECEIVED
AUG 12 1988
HAZARDOUS WASTE

OZONICS RECYCLING CORPORATION
The Atrium Financial Center-Suite 404
1515 N. Federal Highway
Boca Raton, FL 33432
(407) 395-9505

July 14, 1988

Dr. Edward Savard
Baxter Healthcare Corporation
P.O. Box #520672
1851 Delaware Parkway
Miami, Florida 33152

Dear Dr. Savard,

Please find enclosed the quote you requested to eliminate the 164 liters of 2% Dowicide Solution presently in the Baxter inventory.

The quote is eight thousand, nine-hundred dollars for one hundred and sixty four liters of 2% Dowicide Solution.

We are prepared to reduce the "Dowicide" solution by 99.9999% and provide a Certificate of Destruction as verified by Broward Testing Labratories. This service would be effected at your site in the same manner as the original Pilot Study of this year.

It is expected the work would be completed within three days and we could be prepared to commence the process within five days of receipt of a purchase order.

Ozonics Recycling Corporation is interested in developing a long term abatement relationship utilizing our patented technology, not only to aid in reducing levels of contaminates in the waste stream, but to render the effluent fit to be recycled.

We look forward to working with you on this and other related matters.

Respectfully,

Allen F. Legel

Allen F. Legel
C.E.O.

OZONICS RECYCLING CORPORATION
The Atrium Financial Center-Suite 404
1515 N. Federal Highway
Boca Raton, FL 33432
(407) 395-9505

July 25, 1988

Mr. Barry Swihart
Chief of Bureau, Waste Planning & Disposal
Department of Environmental Regulation
26 Blairstone Road
Tallahassee, Florida 32399-2400

Dear Barry,

Please find enclosed a copy of the report on "Dowicide Destruction." After talking to you this afternoon, we reached Andy Wilson of the Pesticide & Toxic Division at USEPA in Atlanta. He explained the reason they were taking the Baxter Dowicide:

a. it was a small amount.
b. they were unaware of an approved method to destroy it.
c. they were going to incorporate it into their sample supply in Atlanta, getting it via the field office in Lakeland.

He expressed an interest in getting the right people in USEPA Atlanta involved so a demonstration could be executed somewhere to the mutual agreement of the Florida DER the Atlanta USEPA and Ozonics.

It would have been nice to have used Baxter's Dowicide because there was a significant sample, a place to effect the demonstration, an independent testing labrotory to monater and report on the pilot, and a funding source motivated to pay for the process. But alas Baxter has accepted EPA Atlanta's offer and is off the hook.

My hope is Andy Wilson will respond to our request to help effect a demonstration soon, now that he has disrupted our use of Baxter's Dowicide.

As anything develops, we will notify you.

Respectfully,

Allen F. Legel
CEO

cc
Alex Padva

OZONICS RECYCLING CORPORATION
The Atrium Financial Center-Suite 404
1515 N. Federal Highway
Boca Raton, FL 33432
(407) 395-9505

July 25, 1988

Mr. Andy Wilson
Pesticides and Toxics
USEPA
Atlanta, Georgia 30308

Dear Andy,

Please find enclosed a copy of the "Dowicide Destruction" report we discussed.

Unfortunately with Baxter Healthcare off the hook we do not have access to a sample of Dowicide to pilot and demostrate for the Florida DER and yourselves.

Perhaps you might interest your collegues in finding a situation in Florida or Georgia, where we might demonstrate our technology as well as abate someones inventory.

We had negotiated financial arrangements with Baxter which would have covered the costs of the pilot including the third party reports. We would however be prepared to do whatever is necessary to get our technology on the list as an approved method to dispose of 'Dowicide.'

We believe there are a great many other similarly constituted toxics and/or pesticides that we could destroy given the chance to demonstrate.

It must be kept in mind that we operate at ambient temperatures and do not create any unwanted by-products or require the landfilling of anything.

Since our system is mobile, there is no need to transport toxic wastes.

Also, inclosed is a copy of the Research triangle bench study on our system as it applies to PCBs in water and sediments.

Respectfully,

Allen F. Legel
CEO

Gob K.

To: Paul W.
Scott B.
Alex P.

From: Jeff Tobergte JT
Date: 7/27/88
Subject: Baxter Healthcare Corp.'s Dowicide (2,4,5-Trichlorophenol).

Today, I received a call from Greg Lee (DER/Tallahassee, SC 278-0190), re: the above chemical. Greg said that EPA has worked out an arrangement to take care of the chemical. Baxter is to deliver the chemical to Carlton Lane (EPA, Pesticides Section, Lakeland, FL). On his next regular trip to EPA/Atlanta, Mr. Lane will deliver the chemical to a lab who has similar chemicals awaiting disposal by EPA. Thus, EPA is going to take care of the matter.

Call Greg if you have any questions.

Reference 7

HAZARDOUS WASTE COMPLIANCE ...

1. EPA I.D. # FLD007854359

2. HANDLER NAME: BAXTER HEALTHCARE

3. ADDRESS: 1851 Delaware Parkway
Miami, FL 33125

3a. COUNTY: Dade

2a. Type Facility: (Circle One)
Treat/Store/Dispose
Non-Handler
Transporter
Generator
Small Quan. Generator
Cond. Exempt S.Q.G.
Exempt

2b. Type Ownership: (Circle One)
Federal
County
Private
State
Municipal

4. DATA ENTRY: (Circle One) NEW UPDATE

5. DATE OF INITIAL EVALUATION WHICH IS THE BASIS OF THIS REPORT ___/___/___

5a. AGENCY RESPONSIBLE FOR EVALUATION: (Circle One) EPA / State / Contractor/EPA / Other / Contractor/State / Oversight

6. TYPE OF EVALUATION COVERED BY THIS REPORT: (Put Code In Box) 3

1 = Compliance Eval. Inspection (CEI)
2 = Sampling Inspection
3 = Record Review
4 = Comprehensive GWM Evaluation (CME)
5 = Compliance Schedule Evaluation
6 = Other
7 = Other - Part B Call-in
8 = Other - Withdrawal Candidate
9 = Other - Closed Facility
10 = Other - General
11 = Case Development Inspection
12 = O & M Inspection
80 = Informal Meeting

7. DATE OF EVALUATION COVERED BY THIS REPORT (Enter Only if Different from 5): ___/___/___

7a. EVALUATION COMMENTS:

8. CLASS AND VIOLATIONS:

Key

X = Violation; O = No Violation; Z = Pending
B = Viol. & Specialty; S = Same Viol./Spec.

Specialties

I = No Insurance only; C = CA Sched. Viol.
R = 3008(h)-like release; * = Class I only

Class of Violation	Violation/Releases GWM/RLSE	C/PC	Fin.Res	Pt.B	Cmpl.Sch	Manifest	Other	Land-Ban
I	X S Z O R* B*	X S Z O	X S Z O I* B*	X S Z O	X S Z O C B	X S Z O	X S Z O	X S Z O
II	X S Z O	X S Z O	X S Z O	X S Z O	X S Z O C B.	X S Z O	X S Z O	X S Z O

8a. Violation Comment:

9. ENFORCEMENT ACTIONS: (Area of Viol./Rlse. = GW, CP, FR, PB, CS, MA, OT, LB, or AA)

Class	Area of Viol./Rlse	Type (use code)	Date Action Taken	Compliance Dates Scheduled	Compliance Dates Actual	Penalty Assessed	Penalty Collected	Resp. Ag. (use code)
	..							
	DATA ENTERED		RECEIVED FEB 11 1988 HAZARDOUS WASTE					
	... 1988							

Codes for Types of Enforcement Actions:
03 = Warning Letter EPA Warn. NOV Ltr.
04 = NOV EPA Admin. Compl.
05 = CO EPA Final Admin. Order
06 = 3013 Complaint
07 = 3013 Final Order
08 = 7003 Admin. Order
10 = Informal
11 = Filed Civil Action
12 = Filed Criminal Action
13 = NOV ~~to~~ State
14 = NOV to EPA
15 = 3008(h) CA Initial Order
16 = 3008(h) CA Final Order
17 = CERCLA 106 Admin. Order
18 = Civil Referral to AG/DOJ
19 = Final Judicial Order

Codes for Resp. Agency:
E = EPA
S = State

10. Enforcement Comment: Record Review, Letter sent

Inspectors Name: PAW

CONVERSATION REC—

Reference 8

Date: 11/8/88

Time: 9:10

File Name: Baxter Healthcare

Contact Person: Paul Wkirzbickl

Phone No.: ( ) Sun 221-5005

Subject: District File

Paul stated that considering the cooperative attitude of Baxter they are low priority on an overwhelming list of inspections. He believes that the Dowicide was taken care of through EPA.

Reference 9

GERAGHTY & MILLER, INC.

NOV 1988

BUREAU OF ... CLEANUP
Twin Towers

HAZARDOUS WASTE SITES CLEAN UP
REMEDIAL ACTION PLAN FEE

PAID

Check No. 80003430 Amount 200 -

Date Rec'd 03/04/88 Initials DS

CONTAMINATION ASSESSMENT PLAN
BAXTER HEALTHCARE CORPORATION
DADE DIVISION
MIAMI, FLORIDA

February 1988

Prepared for:
Baxter Healthcare Corporation
Dade Division
P.O. Box 520672
Miami, Florida 33152

Prepared by:
Geraghty & Miller, Inc.
Ground-Water Consultants
2700 PGA Boulevard, Suite 104
Palm Beach Gardens, Florida 33410

GERAGHTY & MILLER, INC.

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DADE DIVISION
MIAMI, FLORIDA

INTRODUCTION

Baxter Healthcare Corporation, Dade Division, authorized Geraghty & Miller, Inc., in December 1987 to prepare this CAP (Contamination Assessment Plan) for the investigation of possible soil and water contamination at its Miami, Florida, facility. This facility is located at 1851 Delaware Parkway, as shown on Figure 1.

Geraghty & Miller, Inc., conducted a preliminary investigation, and then completed a Preliminary Findings Report during September 1987. During the preliminary investigation, trichloroethene; cis and trans-1,2-dichloroethene; and vinyl chloride were identified in water samples from some monitor wells northeast of the main building. The locations of wells are shown on Plate 1. These compounds were detected by EPA Test Method 601 (purgeable halocarbons). Baxter Healthcare has requested that Geraghty & Miller expand the investigation to include the possibility of contamination from paint and/or paint thinners previously stored in containers between the cooling towers and emergency generators. The compounds previously identified appear to extend beyond the existing outlying monitor wells, except toward the east. The locations of the existing monitor wells are shown on Plate 1. The distribution of compounds and the local ground-water flow patterns may be influenced by rainfall, levels in nearby surface-water bodies, and a storm-water pipeline running west to east across the driveway.

It was determined during the preliminary investigation that the storm-water pipeline acts as a line of local ground-water recharge or discharge, depending upon ground-water elevation. On a larger scale, the ground-water flow pattern may be influenced by the Miami River located about 300 feet northeast of the site, and the Tamiami Canal, located about 700 feet to the northwest. According to a Metropolitan Dade County Department of Environmental Resources Management map of the "Wellfields Cones of Influence" dated December 1980, the site is outside any 210-day travel-time contour and outside any maximum-day protection area contour for major wellfields in Miami.

The objectives of this investigation are to (1) determine the concentration of suspected contaminants at the property line, (2) determine the rate and direction of ground-water movement (if this can be assessed considering the influence of storm-water drainage), and (3) collect hydrogeologic information to determine if a remediation program is necessary and, if so, the most effective design. The ultimate objective of the project is to achieve levels of contaminants established by the County and State. These levels are to be agreed upon before any remedial plan is implemented.

SCOPE OF WORK

During implementation of this CAP, five shallow monitor wells and one intermediate-depth monitor well will be installed. Split-spoon soil samples will be obtained while installing the wells and soil samples will be taken from five additional locations. At two of these additional locations, soil samples will be obtained by hand auger; at the other three locations, soil samples will be obtained by split-spoon. The locations of the proposed monitor wells and soil samples are shown on Plate 1. The soil samples will be surveyed with a TIP air analyzer manufactured by Photovac, Inc. As described in the next sections, selected soil and water samples will be sent for laboratory analysis. These activities will assist in determining the extent of contamination.

Pioneer Laboratory, Inc., (HRS Certification numbers 81142 and T81010) will analyze the samples. Pioneer's Generic Quality Assurance/Quality Control Program is included as a separate document. As a quality assurance check and in order to compare data, one water sample duplicate will be sent to Orlando Laboratories, Inc., (OLI). OLI conducted the previous analyses.

Prior to evacuating and sampling the wells, water levels will be obtained; this may need to be done on several occasions. A slug permeability test will be conducted. These activities will assist in determining the rate and direction of ground-water movement and provide hydrogeologic information.

The activities during implementation of the CAP, results, conclusions and available abatement alternatives will be summarized in a final report incorporating a summary of the preliminary findings and this will constitute a CAR (Contamination Assessment Report). A timetable for implementing the CAP and reporting the results in the CAR is shown in Figure 2.

Soil Samples

Soil-sample locations I and II were selected in the areas where the containers were stored. Split-spoon samples will be collected to 14 feet below land surface. If contaminated soil is encountered in this area, it will not be possible to fully determine the extent because there is not enough area to operate a drill rig and there are underground utilities in the area. Soil-sample location III was selected based upon TIP meter readings while installing Well 2D during the previous investigation. Organic vapors were only detected to a depth of 6 feet. Split-spoon soil samples will be collected to a depth of 10 feet here.

At the above three locations, three such samples above the water table will be collected and analyzed by Pioneer Labs; top foot (immediately below any asphalt), 2 to 3 feet deep, and 3 to 4 feet deep (anticipated water-table interface). Additional samples below the water table will be collected continuously at intervals of 2 feet. Each additional soil sample will be analyzed by the laboratory only if contaminants are detected within 4 feet above it or if the TIP meter indicates a reading above 10. Samples will be analyzed for purgeable halocarbons and aromatics (EPA Test Methods 601 and 602). These methods include trichloroethylene and its breakdown products; benzene; toluene; xylene; and a number of additional constituents. Chromium, lead, and mercury will be tested in soil samples from Locations I, II, and III from the three shallowest depths for laboratory analysis using the hazardous waste EP Toxicity extraction procedure. Three of the split-spoon soil samples with the highest concentrations of metals or volatiles will be analyzed for arsenic, barium, cadmium, selenium and silver (EP Toxicity extraction procedure). If any of these additional metals are detected initially in soils, that parameter will be tested in other soil samples with suspect contamination.

Soil-sample locations IV and V will be hand-augered as deep as possible; access to these areas with a drill rig would be extremely difficult. It is anticipated that limestone will be encountered between 1 and 2 feet deep and that further augering will not be possible. The cuttings will be surveyed with the TIP meter. The results will be evaluated, along with results from the other surveyed locations.

Monitor Wells and Water Samples

The monitor wells will be installed at the proposed locations shown on Plate 1. The wells will be designed and installed as listed below and similar to the previous investigation. Additional specifications and the proposed construction details of the monitor wells are shown on Figure 3.

- Five shallow wells screened from 6 to 13 feet deep (screen length, 7 feet)

- One intermediate-depth well screened from 30 to 35 feet deep (screen length, 5 feet)

- Hollow-stem auger method of drilling

- Continuous split-spoon samples collected in advance of the auger to 15 feet below land surface in the shallow borings

- Similar split-spoon samples will be collected in the intermediate boring, except that below 15 feet the samples will be collected at 5-foot intervals.

- Piping will meet NSF Standard 14 specifications (National Science Foundation, 1980, Plastic Piping Components and Related Materials).

- Sections connected with 3 non-protruding stainless steel screws

- Backfill borehole with silica sand (grade 6/20) to at least two feet above the top of the screen.

- Backfill remaining borehole with neat cement grout (minimum three feet of cement below land surface)

- Steam-clean down-hole equipment between holes

- Clean split-spoons between samples with "Micro" laboratory cleaning solution and rinse with distilled water.

After the new monitor wells are completed, water samples will be obtained from Wells 1S, 2D, 3S, 4S, 5S, 6S, 7D, WH, WK, 10S, 11S, 13D, 14S, and 15S. Samples will be analyzed for purgeable halocarbons and aromatics (EPA Test Methods 601 and 602). If metals are detected by the EP Toxicity procedure in soil samples, then water samples shall be obtained from wells close to soil-sample locations and analyzed for detected metals. A minimum stabilization period of three days will be allowed between developing and sampling the wells.

SAMPLING METHODOLOGY AND MATERIALS

Both soil and water samples will be placed in ice coolers immediately after collection. Sampling equipment will be cleaned with "Micro" soap solution and then rinsed with distilled water.

Soils - A stainless steel tool will be used to transfer the soil from the sampling device to the sample container. Clean sample containers will be obtained from the laboratory. Pioneer Laboratory generally supplies wide-mouth glass bottles with Teflon liners inside the caps. No preservative is used inside the containers for soil samples.

Water - Monitor wells will be evacuated of three to five casing volumes by either pumping or bailing water from the well. Water will be removed from near the water surface in order to ensure that any stagnant water is removed from the water column. Samples will be collected using a Teflon bailer attached to monofilament line. For volatiles, care will be taken to minimize aeration of the samples during the process of sampling and transferring the water. The sample container will consist of a glass vial with a Teflon septum in the cap. It is expected that no preservative will be added to the bottles; Pioneer Laboratory generally analyzes the volatile samples within seven days of collection. If the laboratory anticipates that due to scheduling the sample will be analyzed between eight and 14 days, hydrochloric acid will be added to the vials prior to sampling. For metals, bottles will be preserved with nitric acid.

Respectfully submitted,
GERAGHTY & MILLER, INC.

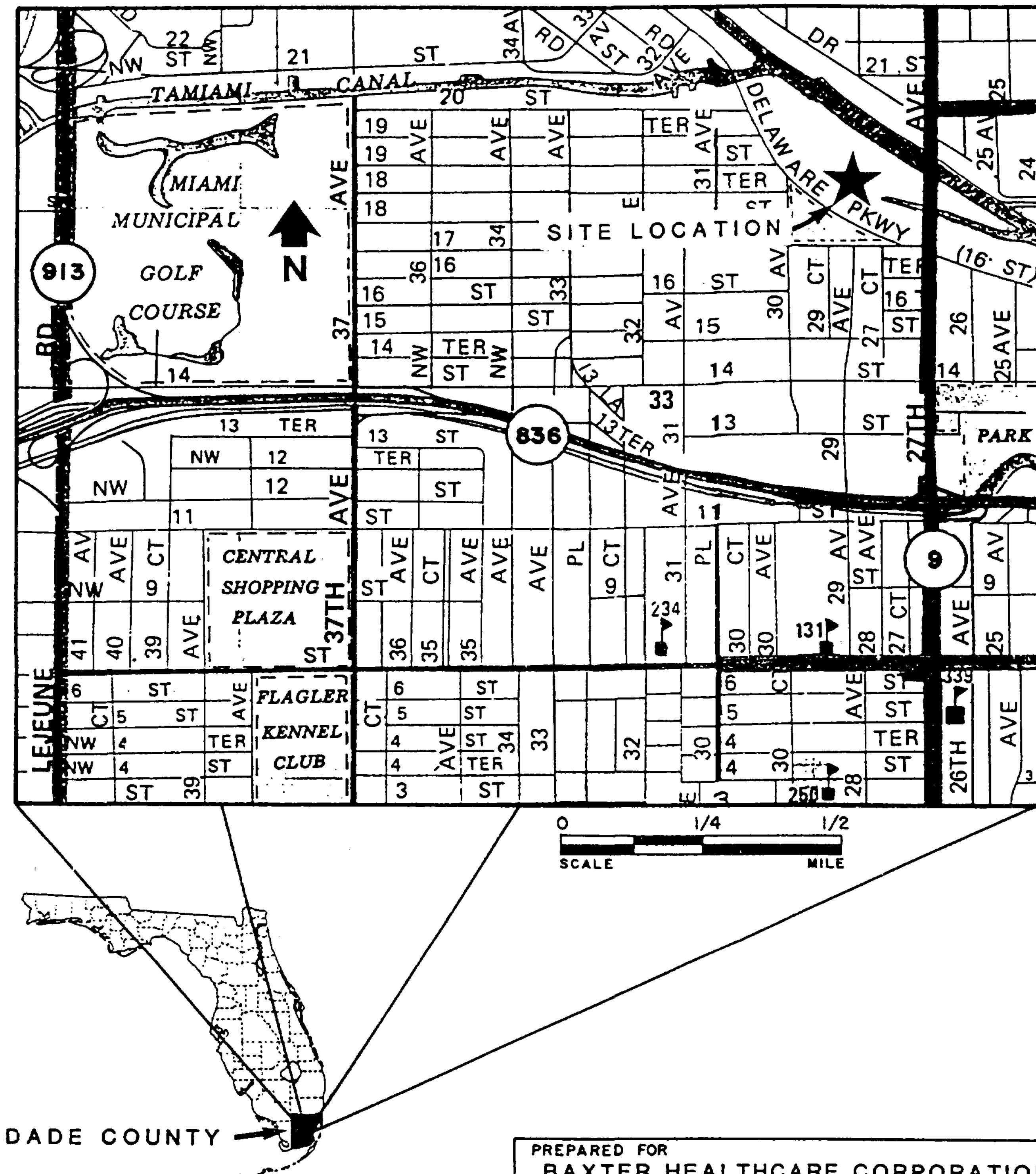
Doug Loeser

Doug Loeser
Staff Environmental Specialist

Thomas L. Tessier

Thomas L. Tessier
Vice President

FIGURES

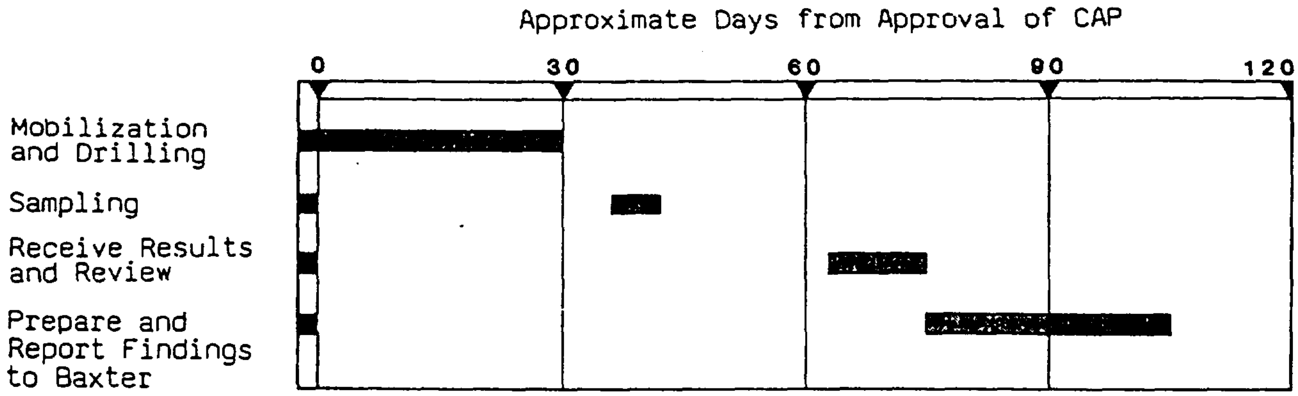


PREPARED FOR BAXTER HEALTHCARE CORPORATION DADE DIVISION		
TITLE SITE LOCATION MAP		
COMPILED BY D. LOESER	Geraghty & Miller, Inc.	DATE AUG. 87
DRAWN BY B. OLIVA	Palm Beach Gardens, Florida	REVISED
CHECKED BY T. TESSIER	SCALE AS SHOWN	FIGURE 1

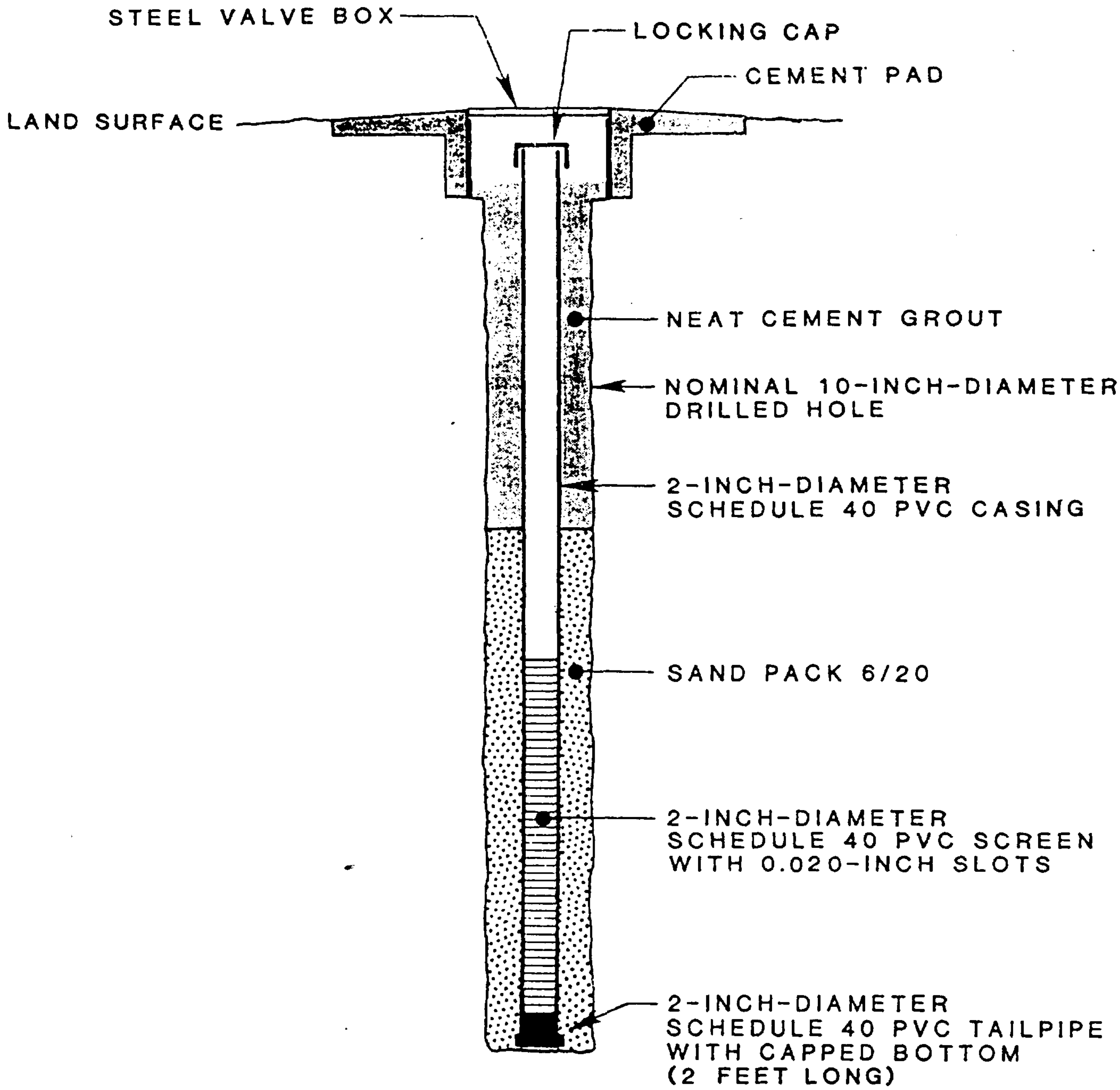
P1148AD1

FIGURE 2

CAP IMPLEMENTATION SCHEDULE



NOTE: An estimated timetable for completing a Remedial Action Plan will be included with the findings of the Contamination Assessment.



PREPARED FOR
BAXTER HEALTHCARE CORPORATION
DADE DIVISION

TITLE
PROPOSED MONITOR WELL CONSTRUCTION DETAILS

COMPILED BY LOESER	Geraghty & Miller, Inc.	DATE DEC. 87
DRAWN BY PADULA	Palm Beach Gardens, Florida	REVISED
CHECKED BY LOESER	SCALE NONE	FIGURE 3

PI 48AD1

PLATE 1

INDEX OF INFORMATION
REQUESTED IN
"DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT
CRITERIA FOR SITE ASSESSMENT"

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6.	Sampling Methods	Page 6
7.	Determination of Cone of Influence Locations	Page 2
8.	Plan Review Fee	*
9.	Timetable	Figure 2
10.	Hydrogeological Information	Page 1

* The Plan Review Fee will be submitted separately by Baxter

Dade Division

Baxter Healthcare
P.O. Box 520672
Miami, Florida 33

Telex 441295

Reference 10

Baxter

NOV 1988

BUREAU OF WASTE CLEANUP
Twin Towers

June 10, 1988

Ms. Delores Smith
Environmental Resources Management
Metro-Dade Center, Suite 1310
111 N.W. 1st Street
Miami, Florida 33128-1971

Re: Containment Assessment Plan for
Baxter Healthcare Corporation
Dade Division, 1851 Delaware Parkway
Miami, Florida

Dear Ms. Smith:

As per our agreement of 5/23/88 requesting an extension for our date of submission (June 1988), you will find enclosed a copy of the Contamination Assessment Report prepared for Baxter Healthcare Corporation, Dade Division, by Geraghty and Miller, Inc.

Among the various abatement plan suggested in the report, Dade is considering the following: Water recovery and treatment will consist of multiple wells with packed-column air stripping treatment. Various means of treated groundwater disposal are still under advisement. A possible solution is the use of storm-water discharge, however, we feel that considerable delay might be encountered in obtaining an NPDES permit if required from the U.S. EPA. The most likely method is the use of the sanitary sewer system. This must be further investigated to determine if a permit can be obtained from the POTW. The use of a shallow trench for groundwater reinjection does not seem feasible because of the limited space available at this facility.

Important to our proceeding with any abatement alternative, DERM must advise us of the final TCE groundwater levels that must be achieved in order to consider remediation complete. We will pursue the remedial action further upon receiving your response to the enclosed report.

Please contact my office at (305)-633-6461, Ext. 343, to set up a mutually agreeable time for Mr. G. Patterson and myself to review the above matters.

Sincerely,

Edward Savard

Edward Savard, Ph.D.
Director, Safety & Environmental Affairs

ES:vc

Encls.

cc: G. Patterson
R. Wurzel

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...rd, Ph.D.	305 633-6461	Ms. Delores Smith	(305)375-3321

Company	Department/Floor No.	Company	Department/Floor No.
[illegible]		Environmental Resources Management ~~Metro-Dade Center, Suite 1310~~	

Street Address	Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.)
[illegible]	111 N.W. 1st Street

City	State	ZIP Required	City	State	ZIP Required
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GERAGHTY & MILLER

CONTAMINATION ASSESSMENT REPORT
BAXTER HEALTHCARE CORPORATION
DADE DIVISION
MIAMI, FLORIDA

June 1988

Prepared for:
Baxter Healthcare Corporation
Dade Division
P.O. Box 520672
Miami, Florida 33152

Prepared by:
Geraghty & Miller, Inc.
Ground-Water Consultants
2700 PGA Boulevard, Suite 104
Palm Beach Gardens, Florida 33410

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BAXTER HEALTHCARE CORPORATION
DADE DIVISION
MIAMI, FLORIDA

INTRODUCTION

During June 1987, Baxter Healthcare Corporation, Dade Division authorized Geraghty & Miller, Inc., to provide hydrogeologic consulting services at its Miami, Florida facility. A preliminary site investigation was conducted, and a Preliminary Findings Report was completed during September 1987. Baxter Dade Division authorized Geraghty & Miller, Inc. to proceed with a Contamination Assessment during March 1988. The subject facility is located at 1851 Delaware Parkway. A site location map is shown as Figure 1 and a site plan is included as Plate 1.

During 1985, the Owner hired a consultant to investigate the possibility that discharges had occurred. Two areas of the site were of special concern - a container storage area located northeast of the main building between the cooling towers and the emergency generator, and an emergency overflow vent located at the northern corner of the main building. Based on information in the Owner's files, soil samples from the container storage area contained trichloroethene as high as 107 ppm (parts per million). Monitor wells were installed by the consultant. Well MW-1 (now designated as Well WH) produced water with detectable concentrations of trichloroethene (0.633 mg/L or milligrams per liter); trans-1,2-dichloroethene (0.871 mg/L); and 1,1-dichloroethene (0.0018 mg/L). Lower concentrations of trans-1,2-dichloroethene and 1,1-dichloroethene were found in water from Wells WC, WD, WE and WF.

During Geraghty & Miller's 1987 investigation, Orlando Laboratories identified concentrations of trichloroethene (0.099 mg/L) and cis and trans-1,2-dichloroethene (0.006 mg/L) in water samples taken from Well

WH. These concentrations were greatly reduced compared to the 1985 study. The highest total concentration of purgeable halocarbons identified in the 1987 investigation was in water from Well 6S, which contained trichloroethene (0.26 mg/L) and cis and trans-1, 2-dichloroethene (0.22 mg/L).

On an overall scale, the ground-water flow pattern may be influenced by the Miami River located about 300 feet northeast of the site, and the Tamiami Canal, located about 700 feet to the northwest. It was determined during the 1987 investigation that the storm-water pipeline that bisects the area of interest influences the ground-water flow pattern. It was determined that the site is outside the "maximum day protection area" of any major wellfields. During the 1988 Contamination Assessment, the investigation was expanded to include additional chemical parameters that could provide evidence of contamination from paint products previously stored in containers between the cooling towers and emergency generators.

FINDINGS

1. Monitoring wells installed on the site in 1985 are approximately 9 to 14 feet deep. Screen intervals and construction materials are unknown. Ten shallow wells (screened from 6 to 13 feet deep) and three deep wells (screened approximately from 30 to 35 feet deep) were installed during the 1987 and 1988 investigations.

2. The site is located over the Biscayne Aquifer which extends to approximately 100 feet deep. The material to 35 feet deep consists mostly of sandstone and limestone. Clay or sand lenses were encountered at various depths in individual boreholes. The fresh water/brackish water interface exists at depths of 30 to 35 feet beneath the site.

3. Shallow ground-water flow at the site was generally away from the center of the site (beneath the paved driveway) toward the Miami River to the north and toward the main building to the south on July 22, 1987; April 29, 1988; and May 11, 1988. This appears to be the dominant flow pattern for the site. On August 28, 1987, flow was toward the center of the site. The shallow ground-water flow patterns may be influenced by rainfall, levels in nearby surface-water bodies, and a storm-water pipeline running west to east across the site. Ground-water flow rates of 0.1 to 0.5 feet per day are expected to be typical.

4. A vertical component of ground-water flow (usually downward) exists at times beneath the site. The magnitude and direction of this vertical component is likely to be influenced by local features also. Recharge to the ground water and its downward movement is limited by the presence of impermeable parking areas.

5. Laboratory analysis of soil samples indicated the presence of only trace concentrations of toluene and trichloroethene at one location.

6. Trichloroethene; 1,2-dichloroethene; and vinyl chloride were identified in water samples taken from some monitor wells northeast of the main building. Trichloroethene and vinyl chloride exceeded Florida ground-water standards for Class G-II water in several wells. The highest concentrations were detected in samples from wells adjacent to the main building and to the north, although samples from wells located to the east also contained elevated concentrations. Trichloroethene and vinyl chloride are present in the ground water at the northeast site boundary and extend to the southwest of the parking area. Based on available data, concentrations of these compounds may be detected in ground water

beyond the northeast site boundary. Vertically, trichloroethene and vinyl chloride are present to a depth of 35 feet beneath the site at some locations.

7. It appears from the distribution and relationship of the identified substances that trichloroethene is the main compound that has been introduced into the ground water. Vinyl chloride 1,2-dichloroethene (cis and trans) may be degradation products of trichloroethene.

8. The movement and concentrations of the identified compounds may be influenced by the presence of the storm-water pipeline.

9. The affected volume of sediments to a depth of 35 feet is 840,000 cubic feet. Soil does not appear to be affected to such a degree as to require removal during remediation.

10. Abatement alternatives and corresponding cost estimates have been reviewed and evaluated for this site, including ground-water recovery, treatment and disposal options. A no action option is not considered by Baxter Dade Division to be an acceptable alternative.

MONITOR-WELL INSTALLATION

Monitor wells for the preliminary investigation were installed between June 26 and July 2, 1987 by Amdrill, Inc., of Port St. Lucie, Florida. Five shallow monitor wells (Wells 1S, 3S, 4S, 5S and 6S), screened between 6 and 13 feet deep, and two deeper monitor wells (Wells 2D and 7D), screened between 30 and 35 feet deep, were installed. Monitor wells for the Contamination Assessment were installed between April 13 and 26, 1988. Five shallow wells (Wells 10S, 11S, 12S, 14S, and 15S) were installed and screened similarly to the previous five. A deeper monitor well (Well 13D) also was installed. This well was screened between 27 and 32 feet deep. The monitor-well locations are shown on Plate 1.

The wells were installed by the hollow-stem auger method of drilling. Continuous split-spoon samples were collected in advance of the auger to approximately 15 feet below land surface at the shallow and deeper well locations. Below 15 feet at the deeper wells, split-spoon samples were taken at 5-foot intervals. A Geraghty & Miller, Inc., geologist described the soil samples and used a TIP air analyzer to detect organic vapors from the soils in the split-spoon samples. All down-hole equipment was steam-cleaned between holes. In addition, the split-spoon sampler was washed with tap water, cleaned with "Micro" laboratory cleaning solution and rinsed with distilled water between each sample.

Each monitor well was constructed of new 2-inch-diameter, Schedule 40 PVC pipe meeting NSF Standard 14 specifications (National Science Foundation, 1980, Plastic Piping Components and Related Materials). The screen has a slot size of 0.020 inches. A 2-foot-long tailpipe with a bottom cap was installed below each screen. Each section of screen and casing was attached with 3 non-protruding stainless steel screws. After the casing and screen were installed, the annulus around the screen was backfilled with silica sand (grade 6/20) to a height of two to three feet above the top of the screen; Well 7D was backfilled with sand to 4 feet above the top of the screen. After the sand was installed, the remaining annulus was backfilled to near land surface with neat cement grout. Wells were developed by air-lift and centrifugal pumping upon completion. Additionally, for the wells installed during the Contamination Assessment, after the boreholes were drilled, the augers were removed and the open hole was developed prior to installation of materials. The well casing was finished slightly below grade in a steel valve box. The cover on the valve box was secured in place by a 5-sided nut. Figure 2 shows typical construction details for the wells installed during this study.

Wells WC through WF had been identified on site drawings prior to Geraghty & Miller involvement in the project; the remaining existing wells were previously either unidentified or not clearly identified. For purposes of this project, the remaining existing wells were identified as Wells WH, WI, WJ, WK and WL. The depths of the existing wells were measured during the preliminary investigation and were found to be about 10 feet deep, plus or minus 1 foot; except Well WH was measured at about 14 feet deep. The screen intervals and construction materials are unknown.

HYDROGEOLOGY

Geologic Conditions

The subject site is located over the Biscayne Aquifer. This aquifer is highly permeable, generally consisting of limestone, oolitic limestone, sandstone, and sand. The Biscayne Aquifer extends to approximately 100 feet deep beneath the site as determined from geologic descriptions from nearby USGS (United States Geological Survey) wells described in Water Resources of Southeastern Florida, Geologic Survey Water-Supply Paper 1255, by Gerald G. Parker, G.E. Ferguson, S.K. Love, and others (1955). The base of the Biscayne Aquifer is marked by the relatively impermeable Hawthorn Formation.

Geologic logs compiled from the 1987 and 1988 investigations are included in Appendix A. Soil Boring 11S was installed in an area where it was not possible to complete a well. Well 11S was installed nearby. Any abandoned holes were filled with cement. The material beneath the site consists mostly of sandstone, sand, and limestone. At several locations, clay and silt were observed near the surface and at deeper depths.

Hydrologic Conditions

The tops of the monitor well casings were surveyed and referenced to a nearby City of Miami bench mark. According to the surveyors, this bench mark is 0.26 feet higher than National Geodetic Vertical Datum. Water-level measurements were made on July 22 and August 28, 1987 and April 29 and May 11, 1988. Tables 1A and 1B list the water-level elevations in the monitor wells. The depths to water were generally between 3 and 5 feet below land surface. Water-level contour maps were drawn from the water-level measurements taken from the shallow wells. Maps of the apparently prevailing flow conditions are shown on Plates 2 and 3. As may be seen, on July 22, 1987 (Plate 2), shallow ground-water flow occurred from beneath the paved driveway to the north and the south. The flow directions established during 1988 were similar to that depicted in Plate 2; however, the gradients were flatter. By comparison, on August 28, 1987 (Plate 3), the shallow ground-water flow was toward the driveway and the hydraulic gradient was rather flat.

Comparing water levels measured during 1987 in the deeper wells (Wells 2D and 7D) with nearby shallower wells, it appears that a downward flow component existed on both days. Interestingly, the water-level difference between adjacent Wells WH and 7D was more than 0.4 foot on July 22, 1987 but less than 0.1 foot on August 28, 1987. According to the National Oceanic and Atmospheric Administration publication "Climatological Data" for Florida, rainfall near the Miami International Airport (west of the site) prior to the July 22 water-level measurements was 0.11 inches on July 21; 0.01 inches on July 20; and 0.46 inches on July 19. In contrast, rainfall for the three days prior to the August 28 water-level measurements was only trace amounts. No rainfall was recorded on the days that water-level measurements were taken. The water-level difference between Well 2D and its nearby wells (1S, 3S) was only about 0.1 foot or less during both investigations.

In the Preliminary Findings Report, water levels of the two deep wells were compared and it appeared that flow in the 30- to 35-foot-deep zone was away from Well 2D and toward Well 7D on July 22. It was stated that the difference in elevations was almost non-existent and could be due to measurement accuracy. During the Contamination Assessment, the elevations of several wells were resurveyed. In the new survey, the elevation of the measuring point of Well 2D was found to be 0.05 feet lower than previously reported. The most recent survey results are used in this report. The resulting water-elevation difference is not great enough to be considered significant.

On April 29, 1988, water-level measurements in the paired Wells 13D and 4S indicated an upward movement of water. The vertical gradient in Well 2D compared to nearby shallow wells was negligible. On May 11, 1988, the vertical flow gradient appeared to be downward in all the deep wells. The water levels in two of the deep wells (Wells 2D and 7D) were less than that of Well 13D in the center of the driveway. These observations suggest that water was moving downward, and away from Well 13D toward the north and south. It appears that the storm-water pipeline continues to influence ground-water flow and it is assumed that the general movement away from the pipeline that was observed in the shallow depths was also occurring to 35 feet deep.

On a more regional scale, historical data on water levels in the Biscayne Aquifer indicate that ground-water flow has been eastward and northeastward toward the Miami River (Biscayne Aquifer, Southeast Florida; U.S. Geological Survey Water-Resources Investigations 78-107; Klein, H., and J. E. Hull; 1978), in this area. The nearest major wellfields are the City of Miami wellfields located at the intersection of NW 57th Avenue (Red Road) and the Miami Canal in Miami Springs, and about one-mile south of that intersection. These wellfields are located about 3 to 3.5 miles northwest of the Baxter Dade Division site. Wells in these wellfields tap highly permeable portions of the Biscayne Aquifer at depths of 60 to 110 feet below land surface. It appears that the Baxter Dade Division site is beyond the area of influence of these wellfields.

The changing pattern of ground-water flow may be greatly affected by rainfall and the water levels in nearby conduits. The Miami River is located about 300 feet northeast of the site and the Tamiami Canal is located about 700 feet northwest of the site. Water levels in both water bodies may influence ground-water levels at the site. The nearest water-level control structures located in these water bodies are each about 1.5 miles upstream from the site. This indicates that surface water near the site is influenced by ocean tides. Chloride concentrations collected from the Miami River nearby at NW 27th Avenue between 1946 and 1964 ranged between about 15 ppm (parts per million) and 17,000 ppm, depending upon flows in the river and wind direction. Thus, the river is periodically salty at this point.

In order to estimate ground-water flow velocity, pumping tests were conducted on Wells 11S and 15S on May 11, 1988. Each well was pumped at slightly more than one gallon per minute for 20 minutes. Water-level recovery data were collected after shutdown. The data were evaluated using Jacob's modification of the Theis equation. Transmissivities of 1440 gpd/ft (gallons per day per foot) and 430 gpd/ft were obtained, respectively.

Ground-water flow velocity (V) can be determined by application of Darcy's Law ($V = PI/n$, where P is permeability, I is hydraulic gradient and n is porosity). Permeability can be calculated as transmissivity divided by aquifer thickness. In this case, the sediments beneath the site increase in clay content below a depth of about 15 feet and it may be assumed that the aquifer thickness affected by this testing extends from the water table (about 4 feet deep) to about 15 feet deep. Therefore, using the transmissivity value determined from Well 15S near the center of the area of interest, permeability of the upper sediments beneath the site is about 39 gallons per day per square foot (430/11) or 5.2 feet per day. Hydraulic gradient and flow direction varies greatly beneath the site, depending upon whether flow is toward or away from the area of the storm-water pipeline. The steepest gradient off the site was measured on July 22, 1987 northeast of the pipeline as about 0.02. Porosity of the limestone-sandstone-sand beneath the site may be estimated at 0.1. Based on these data and assumptions, ground-water velocity in the upper sediments may reach 1.0 foot per day [(5.2) 0.02/0.1]. This is a maximum velocity expected. Extensive paving of the site minimizes ground-water recharge which further reduces hydraulic gradients and velocities. As a result of constantly changing flow directions and gradients, average velocity appears to be in the range of 0.1 to 0.5 feet per day. Movement of any contaminants is expected to be much slower than ground-water flow due to attenuation.

The transmissivities and permeability discussed here are representative of the upper sediments only. The more permeable portions of the Biscayne Aquifer tapped by local wellfields have much greater values. The transmissivity of the Biscayne Aquifer in this area may be estimated from mapped data as 3,000,000 gpd/ft (<u>Electrical-Analog Model Study of a Hydrologic System in Southeast Florida</u>; U.S. Geological Survey Open-File Report; Appel, C.A.; 1973; Figure 8). For the 100-foot thick aquifer in this area, permeability can be estimated as 30,000 gpd/sq ft (gallons per day per square foot) [3,000,000/100] or 4000 feet per day.

The velocity and direction of ground-water flow is highly variable. The prevailing direction of ground-water flow in the shallow sediments is to the northeast with a slight component to the southwest. The average ground-water velocity is expected to be about 0.1 to 0.5 feet per day with any contaminants moving more slowly. Regional flow in the deeper sediments is east and northeast.

Contact was made with the Miami Water and Sewer Authority and the SFWMD (South Florida Water Management District) to determine whether any private wells may exist within one-quarter mile of the site. No wells were identified.

SOIL QUALITY

Tip Meter Measurements

A TIP (total ionization potential) air analyzer was used to detect organic vapors with an ionization potential below 10.6 electron volts from the soils obtained from the split-spoon samples. This meter is sensitive to many purgeable organic compounds such as those expected to be discovered in this investigation. The meter can be used to provide an indication of gross organics levels in the boreholes. It was therefore applied as a screening device to select soil samples for further laboratory analysis. The meter is usually not calibrated when used for this function but merely "zeroed" against ambient air quality. Therefore, values obtained when the meter is not calibrated are dimensionless. Instrument readings are between approximately 0 and 2000 units. TIP readings from the preliminary investigation are shown on Table 2A. Based upon experience with the meter, readings up to 10 are insignificant and may result from possible interferences such as from combustion engine exhaust; readings between 10 and 100 generally indicate the possible presence of low levels of organic compounds; readings from

100 to 500 generally indicate that the tested material is odorous. Readings above 500 indicate high concentrations. In gasoline contamination cases, a reading above 500 has been correlated with floating gasoline encountered on water. It should be noted that subsurface vapors can migrate in the unsaturated zone so that slightly elevated readings may not indicate the soil as a vapor source. Laboratory analysis generally provides a better indication of soil composition because organic compounds are actually purged from the soil for analysis.

The meter was not calibrated during the preliminary investigation, but was calibrated to 100 ppm (parts per million) isobutylene during the Contamination Assessment. The readings during the Contamination Assessment are expressed in ppm of total ionizable compounds. The results from the Contamination Assessment are summarized on Tables 2B and 2C. Readings between the two investigations cannot be compared directly.

The meter detected the presence of ionizable organic compounds in soil at all the well locations except Well 1S. Levels were generally low, however, with readings ranging up to 220 units. Of 145 readings, only two exceeded 100 units. Readings were 10 or less in soils from Wells 10S, 11S, 15D, and soil sample locations I, IV, and V. These soil sample locations are discussed further in the next section. At Well 2D, readings in the soil above the water table (to about 4 feet deep) were as high as 220 units, as high as 12 between depths of 4 and 6 feet, and 0 at deeper depths. At Well 14S, readings up to 78 to the total sample depth were observed. In comparison, at the other locations, the TIP Meter readings ranged between 0 and 33 from the surface to 16 feet deep. In Well 7D, sporadic readings between 0 and 15 were observed from 18 to 35 feet below land surface.

The TIP results obtained during this investigation indicated the existence of possible low levels of organic vapors in the soils. However, the TIP is capable of detecting a number of naturally produced organic vapors that are a by-product of bacteriological activity. These compounds are not detected by laboratory analysis and are unregulated. In addition, extensive pavement on the site may have contributed to organic vapor buildup by trapping them beneath the pavement. In a number of samples where TIP results were relatively high and laboratory analyses were performed, no compounds were detected in the soil samples.

By utilizing the TIP air analyzer as a screening device, it was possible to limit laboratory soil analyses to those with high odor levels. Even where TIP readings were comparatively high, no organic compounds were detected by subsequent laboratory analysis.

Laboratory Analysis of Soils

Split-spoon soil samples were collected for laboratory analyses on April 14, 1988 from three locations. Locations I and II were selected in the areas where containers previously were stored. Split-spoon samples were collected to 14 feet below land surface. Location III was selected as a result of TIP meter readings while installing Well 2D nearby during the previous investigation. Organic vapors previously were only detected to a depth of 6 feet. Split-spoon soil samples were collected to a depth of 10 feet at Location III. Soils at Locations IV and V were measured with the TIP meter, but no samples were selected for laboratory analysis because TIP readings were low.

At Locations I and II, laboratory analysis of samples to the water table were performed for purgeable organics by USEPA Methods 8010 and 8020 plus xylene; and for chromium, mercury and lead by the EP Toxicity Extraction Procedure. Silver, arsenic, barium, cadmium and selenium were analyzed by the EP Toxicity method in samples from one to two feet deep only. Analysis of samples below the water table to a depth of eight feet was continued for purgeable organics plus xylene for Location II.

At Location III, purgeable aromatics and EP Toxicity chromium, mercury and lead were analyzed in samples to four feet deep. Methyl ethyl ketone and methyl isobutyl ketone and EP Toxicity silver, arsenic, barium, cadmium and selenium were analyzed in the sample from the 2- to 3-foot interval at Location III.

Of the soil samples analyzed, only samples from Location II contained detectable concentrations of any parameter tested. Toluene (at 27 ppb) and trichloroethene (at 6 ppb) were detected in the sample from a depth interval of one to two feet. Trichlorethene was detected from 2 to 3 feet deep and from 3 to 4 feet deep (at 3 and 4 ppb, respectively). No evidence of heavy metals contamination indicative of paint wastes was found at any location tested. Soil analysis reports are found in Appendix B1.

WATER QUALITY

Geraghty & Miller, Inc., sampled Monitor Wells 1S through 7D and existing Monitor Wells WC through WL on July 21 and 22, 1987. The wells were purged by removing 3 to 6 casing volumes with a centrifugal pump prior to sampling, or were pumped until the water cleared. Any sampling equipment in contact with the water was cleaned in a "Micro" laboratory cleaning solution and rinsed with distilled water prior to taking the samples. A Teflon bailer attached to monofilament line was used to obtain the water samples. An equipment-cleaning blank for quality control was taken in order to check on the cleaning procedures and was identified as Sample WB. A duplicate quality-control sample was collected from Well 7D in order to verify the sampling and analytical performance. The duplicate was identified as 7S. The samples were shipped in a cooler filled with ice to Orlando Laboratories, Inc., Orlando, Florida. Orlando Laboratories analyzed the samples for purgeable halocarbons using USEPA Test Method 601, which includes trichloroethene and its breakdown products. The Orlando Laboratories' analytical reports are included in Appendix B2. A summary is provided as Table 4A. In 1987, Orlando Laboratories reported cis-1,2-dichloroethene and trans-1,2-dichloroethene as one compound (c,t-1,2-dichloroethene). These are two similar compounds called "isomers." Method 601 includes only the "trans" isomer.

Trichloroethene; cis,trans-1,2-dichloroethene; and vinyl chloride were identified in water samples taken from the monitor wells during the preliminary investigation. Trichloroethene in excess of the State ground-water standard was identified in samples from Wells 1S, 3S through 7D, WC through WF, and WH. The average concentration of trichloroethene detected in samples was 0.091 mg/L. Vinyl chloride was identified in the sample from Well 3S in excess of the State standard. These compounds were not detected in samples from Well 2D or from Wells WI through WL.

The State of Florida ground-water standard for trichloroethene in Class G-II water is 0.003 mg/L. This compound; 1,1-dichloroethene; and cis,trans-1,2-dichloroethene (two isomers of 1,2-dichloroethene) can degrade to vinyl chloride. The State standard for vinyl chloride is 0.001 mg/L. The new Federal standard for 1,1-dichloroethene that will become effective on January 9, 1989 is 0.007 mg/L; the State has no standard. Other Federal standards that will become effective on this date include trichloroethene (0.005 mg/L) and vinyl chloride (0.002 mg/L). EPA is in the process of proposing a standard of 0.07 mg/L for both cis-1,2-dichloroethene and trans-1,2-dichloroethene. If this rule is finalized, EPA expects that the effective date will be in late 1990. Dade County usually enforces the State ground-water standards; no specific County standards exist.

Chloroform, which is a trihalomethane, was identified in Samples 7S and WH at concentrations as high as 0.021 mg/L. The State standard for total trihalomethanes is 0.10 mg/L. Because chloroform was not identified by the laboratory in any other samples, the chloroform may be an analytical laboratory contaminant. Chloroform is typically found in the analytical laboratory environment. The fact that results from Samples WH and 7S were almost identical (including chloroform) strongly suggests that a sample identification error was made, at least among Samples WH, 7S, and 7D. Sample 7S appears to be a duplicate of WH rather than 7D. This is supported by a comparison of the proportion of cis,trans-1,2-dichloroethene in Sample 7D to that in Samples 7S and WH. Methylene chloride, which is also used in the laboratory, was identified during the preliminary investigation only in the sample from Well WK.

On April 28 and 29, 1988; during the Contamination Assessment, Wells 1S through 7D, WH, and WK were resampled for comparison with 1987 data and newly installed Wells 10S, 11S, 13D, 14S, and 15S were sampled for the first time. These were analyzed for purgeable organics by USEPA Test Methods 601 (purgeable halocarbons) and 602 (purgeable aromatics). Results are contained in Appendix B3. Table 4B summarizes the data. The sampling procedure generally was the same as during the previous investigation with one exception; isopropyl alcohol was used for decontamination of sampling equipment, after the "Micro" solution. Pioneer Laboratory, Inc. analyzed the samples; one duplicate sample (from Well 14S) was sent to Orlando Laboratories, Inc. for comparison. In addition to this quality-assurance sample, duplicates of Well 3S and 14S and two equipment-cleaning blanks were collected for analysis by Pioneer Lab. The identifications of these samples are listed on Table 4B along with a summary of the analytical results. The trichloroethene concentration from Well 14S obtained by Orlando Laboratories, Inc. was somewhat lower than that indicated by Pioneer. Also, only Orlando Labs identified 1,1,1 trichloroethane, at a concentration of 0.006 mg/L.

Vinyl chloride was identified only by Pioneer Lab, at the same concentration. This difference with the latter two compounds is to be expected, close to the detection limit. The other duplicates analyzed by Pioneer were reasonably consistent. No contaminants were detected in the equipment-cleaning blank. Methylene chloride and chloroform were not identified, confirming that previously they were most likely laboratory contaminants.

Analytical results during the Contamination Assessment were elevated compared to the previous investigation. Well 1S contained 30 mg/L of trichloroethene (Well 1S was resampled in May 1988 to verify this concentration); Well 5S contained about 7 mg/L; Well WH contained 5 mg/L and Well 14S contained about 1 mg/L. (In contrast, Well 5S previously contained the highest trichloroethene concentration at 0.280 mg/L). Well 13D contained about 2 mg/L of trichloroethene. Well 2D contained trichloroethene at a concentration of 0.004 mg/L. This well also contained trans-1,2-dichloroethene (0.032 mg/L). Previously, no purgeable organics were detected in this well. In contrast, Well 7D which previously contained cis, trans-1,2-dichloroethene and trichloroethene, was free of purgeable organics during this investigation. The property boundary shallow well (Well 10S) contained trichloroethene (0.016 mg/L), and vinyl chloride (0.005 mg/L) in excess of State ground-water standards as well as trans-1,2-dichloroethene (0.310 mg/L). Overall, the average concentration of detectable trichloroethene in the April 1988 samples was 3.5 mg/L. It appears that any increase in organic concentrations reflects a change in the laboratory, rather than an actual increase.

As shown on Plate 4, total purgeable halocarbons in the shallow zone beneath the site extend to the northeast boundary and southwest beneath the main building. Northwest and southeast, the extent is limited to the paved parking area behind the main building. Purgeable organics have reached the 35-foot depth in this area.

At the time that water from the wells was sampled for laboratory analyses, water samples were also collected from selected monitor wells for field tests of conductivity and chlorides. The results are summarized in Table 5. The readings were collected to make comparisons among locations. The most significant information obtained from these field tests was the difference in Well 13D with a reading of 900 umhos/cm compared to the other two deep wells (Wells 2D and 7D) where the readings were 3700 and 4200 umhos/cm respectively. The water from Well 13D is of similar quality to that of the shallow zone. These data indicate that the deep wells are very close to the fresh water/brackish water interface. Regional data (Biscayne Aquifer, Southeast Florida; U.S. Geological Survey Water Resources Investigations 78-107; Klein, H., and J. E. Hull; 1978) indicate that the deeper portions of the Biscayne Aquifer in this area have been affected by salt-water intrusion since at least 1943. Water in the storm drains also is similar in conductivity to that in the shallow zone. Potable water has a maximum conductivity of about 1000 to 1200 umhos/cm.

ABATEMENT ALTERNATIVES

Of the 32 compounds analyzed by EPA Methods 601 and 602, only three compounds were detected in the ground water. These chemicals of primary concern (trichloroethene, trans-1,2-dichloroethene, and vinyl chloride) exist in the water phase. Although these may exist in the shallow sediments, they have been found in only trace concentrations in soils above the water table and at only one location. Therefore, abatement alternatives will primarily focus on remediation of the ground water for trichloroethene and its breakdown products.

Based on the estimated extent of the 0.050 mg/L contour of total purgeable halocarbons shown in Plate 4, 840,000 cu ft of sediments could be affected to a depth of 35 feet. With an assumed effective porosity of the shallow sediments of 0.1, 630,000 gallons of affected ground water within these sediments may be assumed to be recoverable within the volume. Assuming that 50 to 100 times the affected volume may need to be treated, that volume amounts to 31.5 to 63 million gallons.

There are three elements to the remediation of ground water; water recovery from the ground, treatment of the water, and disposal of the treated water. In some cases, a "no action" alternative may be considered as an abatement alternative. However, in this case, where concentrations of some compounds exceed State ground-water standards at the northeast property boundary, the no action alternative was not considered. The ultimate fate of chemicals and the length of time needed to clean up ground water under the no action alternative could be considered in a feasibility study. Such a study should include a risk assessment.

Ground-Water Recovery

There are three basic options for ground-water recovery: recovery trench, single recovery well, multiple recovery wells, or a combination thereof. The advantages, disadvantages and "order of magnitude" costs are presented for various alternatives. **Recovery trenches** are typically used in areas of low permeability and where floating contaminants exist. A trench is limited as to the depth to which it could be practically installed; thus it is used for removing contaminants from the shallowest portion of the aquifer. The affected depth of this site has moderate permeability and stratified geologic conditions. Elevated concentrations of organics have been detected to a depth of 35 feet. Trench construction to this depth would be very difficult. Because of the underground utilities and above-ground structures at the site, installation of a trench would be very disruptive.

Advantages: Unquestioned extent of capture area

Ease of operation

Disadvantages: Difficult construction probably requiring permit.

Would require dewatering for installation and treatment of water.

Large recovery volume needed to affect downgradient areas.

May require water-use permit

Not flexible operationally

Cannot be selective in minimizing recovery of uncontaminated water.

Costs: Installation assuming 200 linear feet, $45,000

Annual operation and maintenance, $3,000

A **single recovery well** installed to the depth of the affected area could be used for recovery. However, in this case, two areas have been affected on opposite sides of the local ground-water divide (the storm-water pipeline). A relatively high pumping rate and long pumping time will be needed to influence both of the areas and effect recovery at the northeast property boundary.

Advantages: Ease of installation

Simple operation

No construction permit

Disadvantages: Large volume and long pumping time needed to recover all affected water.

Requires some management and monitoring

Costs: Installation, $9,000

Annual operation and maintenance, $2,000

Multiple recovery wells could be installed that capture the affected volume. Wells can be placed in the two identified areas of highest concentration and pumpage can be adjusted to minimize inflow of uncontaminated water.

Advantages: Ability to locate wells in key areas and manage pumpage on well-by-well basis to minimize volume and shorten recovery time.

Simple, non-disruptive construction

Flexibility to add or remove wells and adjust flow rates.

No construction permit

Disadvantages: Requires attentive management and maintenance.

Costs: Installation based upon two wells, $16,000

Annual operation and maintenance, $3,000

Ground-Water Treatment

Three practical treatment options are available: carbon adsorption, in-situ biological treatment and packed-column air stripping. **Carbon adsorption** could be effective in treatment of ground water at this site. The system is highly effective in treating the compounds of interest. Installation is relatively simple. However, capital costs are moderate and operating costs are relatively high because of the need to replace or regenerate the carbon. Up to 50,000 pounds of carbon could be needed during the first year. If carbon is replaced, disposal as hazardous waste may be necessary at additional cost. Considering the high volume, high concentration and long pumping time that may be anticipated, operating costs are a significant factor. Carbon adsorption is often used as final treatment after air stripping.

Advantages: Ease of installation

Effective treatment of compounds of interest

Flexible to flows and concentrations

Disadvantages: Frequent replacement/regeneration

Inorganic compounds may foul carbon prematurely.

If the carbon is replaced, the spent carbon might have to be disposed as hazardous waste.

Potential complex operation

Costs: Installation, $100,000

Annual operation and maintenance, approximately $75,000 plus disposal costs.

In-situ biological treatment is an experimental alternative with potential complications in its implementation. One of the major problems is that trichloroethene is a compound containing three chlorine atoms. This makes it difficult for the "bugs" to break down this compound. Trichloroethene and its breakdown products are not native to the environment and are persistent. The naturally existing biological community is usually incapable of degrading these contaminants to non-toxic compounds. Therefore, the correct biological agents must be added to the water. The correct type of "bugs" must be acclimated to the site conditions and then the bugs and the correct amount of nutrients must be added to the water. Getting this combination of conditions to the area of concern can be a problem. This option requires much site-specific development and the degree of cleanup is often not as complete as with other options.

Advantages: No effluent generated

No permitting required

Disadvantages: Requires extensive testing and monitoring.

Areal application difficult

Experimental concept is difficult to "sell".

Potential exists for "bugs" to multiply excessively and to "plug" the aquifer, creating a problem for cleanup.

Costs: Start-up costs, $75,000

Annual operating expenses depend upon site conditions and problems encountered with experimental technology.

Packed-column air stripping is typically the most effective and economical alternative. The dimensions of the tower can be designed to accommodate various flow rates and the type of contaminants. This option often is used to treat water containing similar contaminants and under similar conditions to those existing at the subject facility. The technology is widely available, and is more reliable than other options.

Advantages: Established method

Applicable to site-specific compounds

Simple installation

Moderate operation and management

Can be overdesigned to minimize testing

Portable and reuseable

Disadvantages: Requires periodic maintenance

Costs: Installation, $40,000

Annual operation and maintenance, $15,000

Ground-Water Disposal

Three practical alternatives are available for disposal of the treated water: the nearby storm drainage system, the sanitary sewer system and on-site recharge. Disposal to the **storm-water drainage system** would ultimately result in a discharge to the Miami River. This option by itself would be inexpensive, except that an NPDES permit may be required by the USEPA (United States Environmental Protection Agency). The NPDES permitting process involves initial bioassay toxicity testing and possibly additional monitoring. Basically, it would have to be shown that the discharge is non-toxic to indicator organisms. This type of testing is expensive, time-consuming and could result in a permit not being issued. The best information available is that this permitting process could take up to a year.

Under certain circumstances, USEPA will issue an administrative order allowing a discharge without a permit. Baxter Dade Division may wish to investigate this possibility. However, the capacity of the drainage system will have to be sufficient to handle storm events and the treatment system discharge. At the present time, the capacity has not been evaluated but is probably adequate.

Advantages: System in place and operating

Accessible

Disadvantages: Possible stringent discharge standards

Difficult and time-consuming to permit

Costs: Permitting, $30,000

Annual testing, $20,000

The **sanitary sewer system** is another option that could be considered. The utility operator would have the option of whether to accept the treated water. One issue that would need further investigation os the capacity of the sanitary sewer to handle the added flow. Utility rates for high volume, long-term discharges are typically expensive.

Advantages: Less stringent discharge criteria

Minimal management

Disadvantages: Some construction probably needed

Requires utility approval

Limited flow capacity

Costs: Installation, approximately $20 per foot to install pipe from equipment compound (location to be determined).

Annual operation and testing, $35,000 at 60 gpm and $1 per 1000 gallons.

It is likely that **on-site recharge** through an exfiltration gallery could be designed and installed that would be sufficient to handle the necessary flow rate. The system can be overdesigned to accommodate increases in flow or decreases in efficiency. Discharge standards are less stringent if discharge takes place within the area of influence of ground-water recovery. Discharge upgradient can be utilized to enhance recovery. An alternate form of on-site recharge would be a recharge well into deeper, more permeable sections of the Biscayne Aquifer. This system may be more difficult to permit and would not significantly enhance recovery.

Advantages: Widely accepted and permittable

Less stringent discharge standards

Can enhance recovery

Simple operation

Disadvantages: Because of shallow depth to ground water, a large area may be required.

May require some maintenance

Costs: Installation $20,000, assuming 200 feet long, by 3 feet deep, by 4 feet wide.

Annual maintenance, $2,000

Additional Considerations

The effect of the storm-water drainage system must be taken into consideration. This drainage system at times appears to be adding water to the ground-water system, thus acting as a driving force in helping to spread the contamination. It also will help dilute contaminants, assuming that this water is clean. It would not be logical to treat clean water being contributed by the drainage system. Therefore, any remediation program should consider identifying any discharges from the storm-water system and taking measures to eliminate them. Assuming a ground-water recovery system is used, another consideration is that once a cone of depression is created, contaminants may remain on the soils above the water. These could re-dissolve in percolating rainwater or if the ground water should rise for any reason. After the water recovery system is operating, soils samples can be taken from close to one of the recovery wells while it is operating. If contaminants are identified in the unsaturated soils, installation of a VES (Vacuum Extraction System) may be considered. A VES system consists of a series of wells or buried pipes designed to remove vapors through the unsaturated zone and ultimately vent them to the atmosphere. A VES system is relatively inexpensive to install and operate and may help to accelerate cleanup by removing residual soil contamination that has not been identified by sampling, but may be contributing contaminants to the ground water.

Respectfully submitted,
GERAGHTY & MILLER, INC.

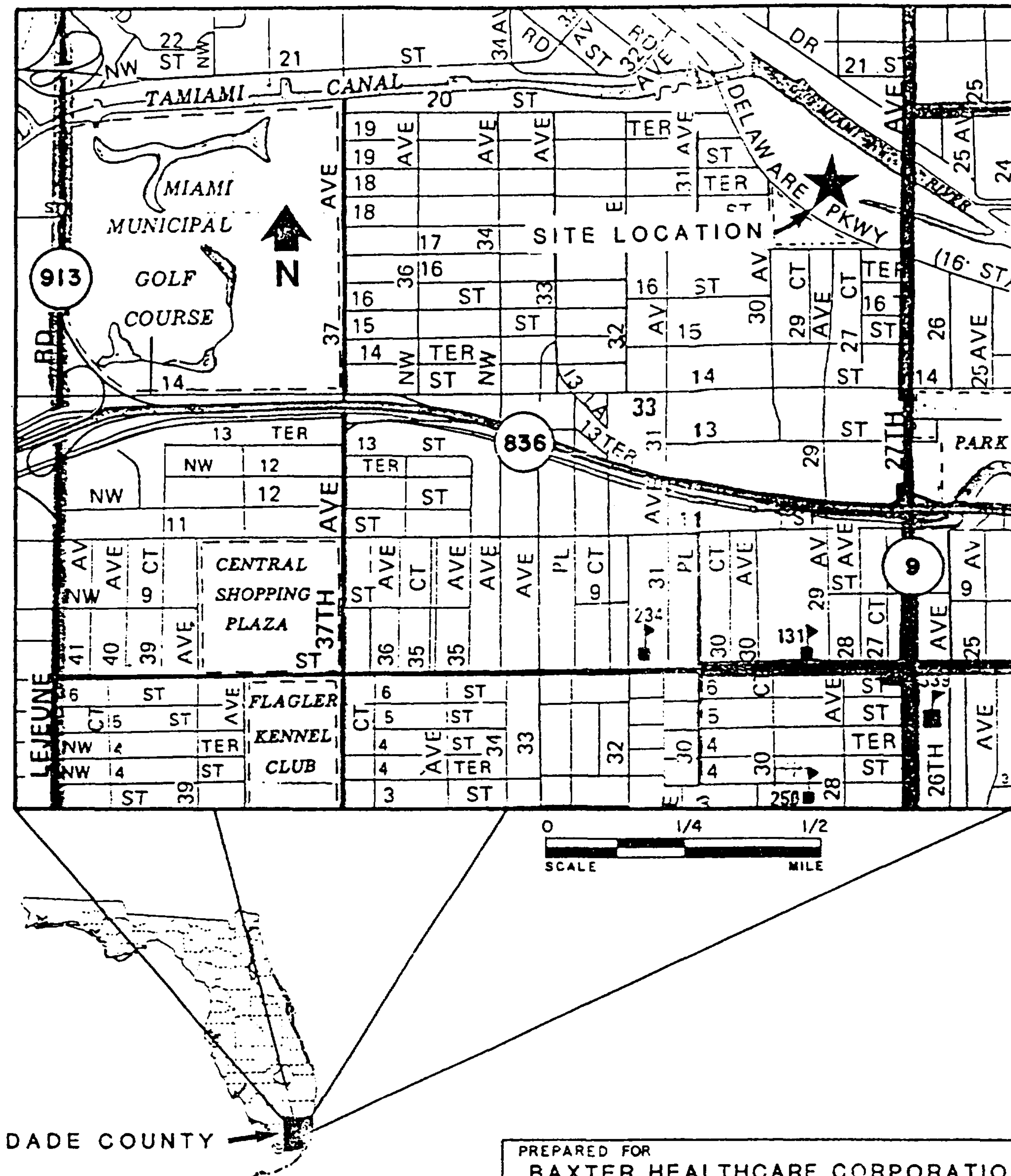
Doug Loeser
Staff Environmental Specialist

Thomas L. Tessier

Thomas L. Tessier
Vice President

June 1988

FIGURES

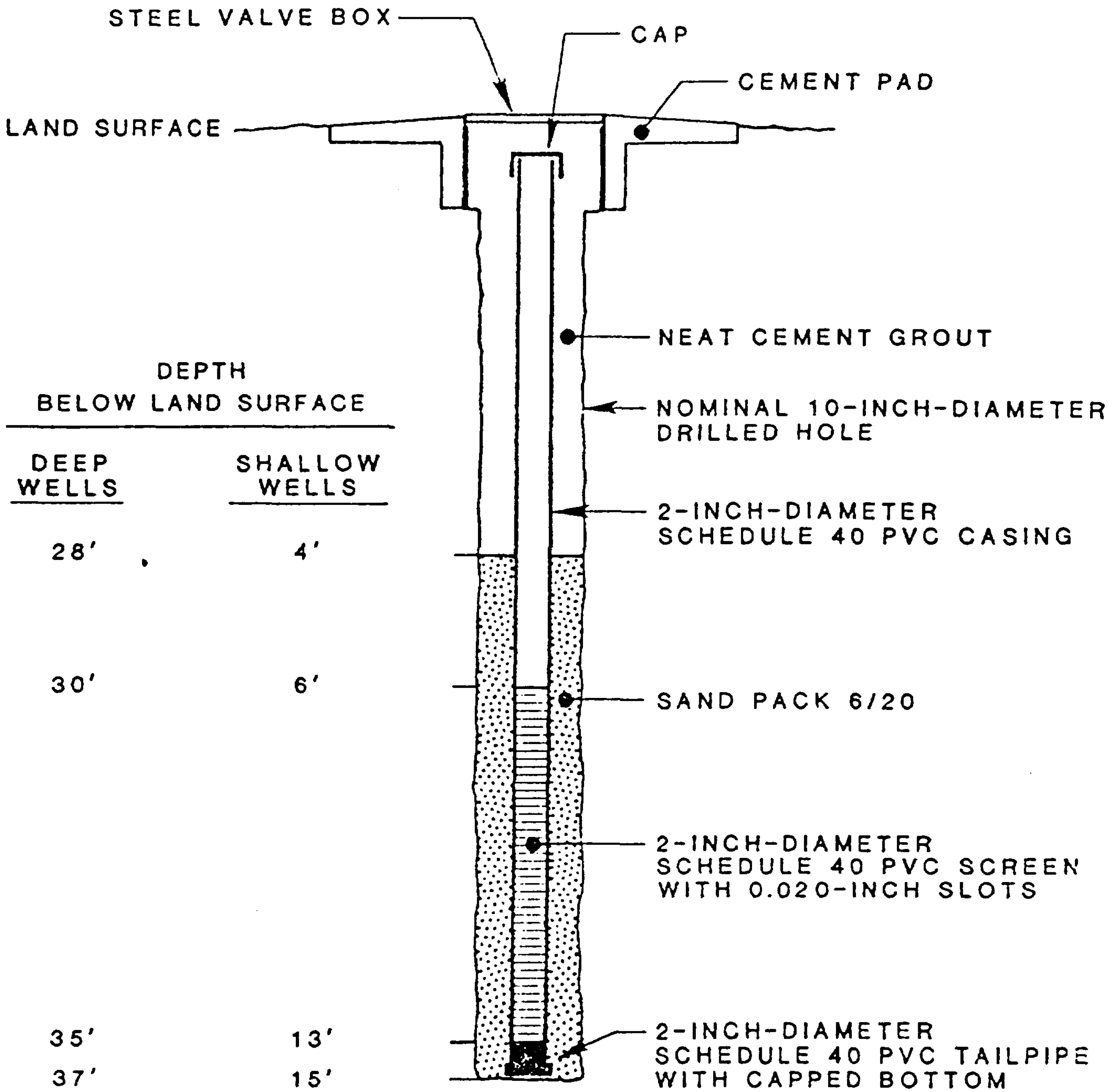


PREPARED FOR
BAXTER HEALTHCARE CORPORATION
DADE DIVISION

TITLE

SITE LOCATION MAP

COMPILED BY D. LOESER	Geraghty & Miller, Inc.	DATE AUG. 87
DRAWN BY B. OLIVA	Palm Beach Gardens, Florida	REVISED
CHECKED BY T. TESSIER	SCALE AS SHOWN	FIGURE 1



PREPARED FOR
BAXTER HEALTHCARE CORPORATION
DADE DIVISION

TITLE

TYPICAL SHALLOW AND DEEP MONITOR WELL CONSTRUCTION DETAILS

COMPILED BY LOESER	Geraghty & Miller, Inc.	DATE AUG 87
DRAWN BY PADULA	Palm Beach Gardens, Florida	REVISED
CHECKED BY LOESER	SCALE NONE	FIGURE 2

GERAGHTY & MILLER, INC.

TABLES

TABLE 1A

WATER LEVELS
July 22 and August 28, 1987

Well Number	Top of Casing Elevation	Depth to Water 7/22/87	Water-Level Elevation 7/22/87	Depth to Water 8/28/87	Water-Level Elevation 8/28/87
WC	4.90	3.42	1.48	3.59	1.31
WD	4.88	3.35	1.53	3.54	1.34
WE	4.65	3.21	1.44	3.33	1.32
WF	4.66	3.20	1.46	3.35	1.31
WH	4.96	3.70	1.26	3.66	1.30
WI	4.50	3.44	1.06	3.17	1.33
WJ	4.70	3.67	1.03	3.37	1.33
WK	4.82	3.76	1.06	3.49	1.33
WL	4.75	3.64	1.11	3.40	1.35
1S	4.69	3.79	0.90	3.41	1.28
2D	4.58*	3.83	0.75	3.41	1.17
3S	4.48	3.60	0.88	3.24	1.24
4S	4.75	3.31	1.44	3.45	1.30
5S	4.90	3.40	1.50	3.59	1.31
6S	4.625	3.36	1.265	3.35	1.275
7D	4.70	3.92	0.78	3.43	1.27

Notes: All depths reported as "feet below top of casing."

All elevations reported relative to a City of Miami bench mark.

Blank spaces indicate no measurement taken.

* The elevation of Well 2D was corrected from the previous report as described in the text.

TABLE 1B

WATER LEVELS
April 29 and May 11, 1988

Well Number	Top of Casing Elevation	Depth to Water 4/29/88	Water-Level Elevation 4/29/88	Depth to Water 5/11/88	Water-Level Elevation 5/11/88
WC	4.90			4.26	0.64
WD	4.88			4.16	0.72
WE	4.65			4.04	0.61
WF	4.66			4.03	0.63
WH	4.96			4.40	0.56
WI	4.50			3.93	0.57
WJ	4.70			4.16	0.54
WK	4.82	3.68	1.14	4.24	0.58
WL	4.75			4.13	0.62
1S	4.69	3.49	1.20	4.24	0.45
2D	4.58*	3.39	1.19	4.25	0.33
3S	4.48	3.28	1.20	4.05	0.43
4S	4.75	3.70	1.05	4.08	0.67
5S	4.90	3.75	1.15	4.34	0.56
6S	4.625	3.43	1.195	4.17	0.455
7D	4.70	3.48	1.22	4.25	0.45
10S	4.66	3.47	1.19	4.20	0.46
11S	5.82	4.66	1.16	5.21	0.61
12S	4.30	3.07	1.23	3.82	0.48
13D	4.70	3.41	1.29	4.20	0.50
14S	4.46	3.24	1.22	3.93	0.53
15S	4.26	3.02	1.24	3.81	0.45

Notes: All depths reported as "feet below top of casing."

All elevations reported relative to a City of Miami bench mark.

Blank spaces indicate no measurement taken.

* The elevation of Well 2D was corrected from the previous report as described in the text.

TABLE 2A

TIP METER RESULTS
6/27/87 THROUGH 7/2/87

Feet Below Land Surface	Well 1S	Well 2D	Well 3S	Well 4S	Well 5S	Well 6S	Well 7D
0- 2	0	220	10	28	33	25	10
2- 4	0	160	22	14	6	15	18
4- 6	0	12	16	28	29	12	5
6- 8	0	0	15	32	31	8	5
8-10	0	0	0	4	21		0
10-12	0	0	0	4	15		0
12-14	0	0	0	6	12		0
14-16	0	0	0	7	15		0
16-18		0					
18-20		0					15
23-25		0					0
28-30		0					6
33-35							7

Notes: Blank space means no sample obtained.

TIP meter results obtained 6/27/87 through 7/2/87 are dimensionless.

TABLE 2B

TIP METER RESULTS
4/13/88 THROUGH 4/26/88

Feet Below Land Surface	Well 10S	Well 11S	Well 12S	Well 13D	Well 14S	Well 15S
0- 2	1	2	11	10	17	1
2- 4	4	2	7	15	36	1
4- 6	3	2	1	10	45	1
6- 8	1	2	5	10	46	0
8-10	0	2	0	9	78	2
10-12	7	3	1	4	38	1
12-14	8	2	3	9	65	1
14-16	4	1	2	10	70	2
18-20				3.8		
23-25				10.4		
28-30				9.0		
33-35				1.2		

Notes: Blank space means no sample obtained.

TIP meter results obtained 4/13/88 through 4/26/88 are in ppm of total ionizable compounds, as isobutylene.

TABLE 2C

TIP METER RESULTS
4/11/88 THROUGH 4/14/88

Feet Below Land Surface	Soil Sample Location I	Soil Sample Location II	Soil Sample Location III	Soil Sample Location IV	Soil Sample Location V
0- 1				10	0
1- 2	4	8	4	0	0
2- 3	3	2	28	0	0
3- 4	5	3	20	0	
4- 5	3	2	15	0	
5- 6	3	2	15		
6- 8	7	11	28		
8-10	10	2	18		
10-12	4	3			
12-14	7	4			

Notes: Blank space means no sample obtained.

TIP meter results were obtained 4/11/88 through 4/14/88 and are in ppm of total ionizable compounds, as isobutylene.

TABLE 3

SOIL ANALYSIS MATRIX

Sample Parameters	Sample Interval	Sample Locations I	II	III
8010, 8020, xylene	1 - 2	X	X	X
EPT - Cr,Hg,Pb		X	X	X
EPT - other		X	X	
8010, 8020, xylene	2 - 3	X	X	X
EPT - Cr,Hg,Pb		X	X	X
EPT - other				X
MEK, MIBK				X
8010, 8020, xylene	3 - 4	X	X	X
EPT - Cr,Hg,Pb		X	X	X
8010, 8020, xylene	4 - 6		X	
8010, 8020, xylene	6 - 8		X	

Notes: "8010, 8020, xylene" refers to analysis for purgeable organic parameters by USEPA Methods 8010 and 8020.

"EPT - Cr,Hg,Pb" refers to analysis for chromium, mercury and lead by the EP Toxicity Extraction Procedure.

"EPT - other" refers to analysis for silver, arsenic, barium, cadmium and selenium by the EP Toxicity Extraction Procedure.

"MEK, MIBK" refers to analysis for methyl ethyl ketone and methyl isobutyl ketone.

TABLE 4A

SUMMARY OF ANALYTICAL REPORTS
WATER SAMPLES COLLECTED JULY 21 AND 22, 1987

Sample Identification	chloroform	cis,trans-1,2-dichloroethene	trichloroethene	vinyl chloride	methylene chloride
1S		0.11	0.15		
2D					
3S		0.19	0.019	0.015	
4S		0.068	0.029		
5S		0.008	0.28		
6S		0.22	0.26		
7D		0.046	0.003		
7S	0.020	0.005	0.096		
WB					
WC		0.012	0.11		
WD			0.022		
WE		0.012	0.013		
WF		0.020	0.005		
WH	0.021	0.006	0.099		
WI					
WJ					
WK					0.074
WL					

Notes: Results reported in mg/L.

A blank space means result was not detected at a detection limit of 0.001 mg/L.

WB and 7S are quality-control samples.

Orlando Laboratories in 1987 reported the results of cis-1,2-dichloroethene and trans-1,2-dichloroethene as one compound. It should be noted that EPA Test Method 601 only lists the trans isomer.

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TABLE 4B

SUMMARY OF ANALYTICAL REPORTS
WATER SAMPLES COLLECTED APRIL 28 AND 29, 1988

Sample Identi-fication	QA Sample	trans-1,2-dichloro-ethene	trichloro-ethene	vinyl chloride	1,1,1 trichloroethane
1S		0.140	30	0.002	
2D		0.032	0.004	0.010	
3S		0.050	0.051	0.021	
	3B	0.067	0.025	0.023	
4S		0.091	0.019		
5S		0.092	6.9	0.009	
6S		0.038	0.003		
7D					
WH		0.110	5.0	0.002	
WK					
10S		0.310	0.016	0.005	
11S					
	11A				
13D		0.200	2.1		
14S		0.160	0.900	0.006	
	14A				
	14B	0.140	0.810	0.004	
	14C	0.19	0.14	0.006	
15S					

Notes: Results reported in mg/L.

A blank space means result was not detected

A confirmatory sample from Well 1S obtained on May 27, 1988 contained 25 mg/L of trichloroethene; 0.3 mg/L of trans-1,2-dichloroethene; and 0.003 mg/L of vinyl chloride.

KEY TO QUALITY-ASSURANCE SAMPLES

3B Duplicate of 3S
11A Equipment-Cleaning Blank
14A Equipment-Cleaning Blank
14B Duplicate of 14S
14C Duplicate of 14S analyzed by Orlando Laboratories

Orlando Laboratories in 1988 reported the results of cis-1,2-dichloroethene (not detected) and trans-1,2-dichloroethene. Pioneer only reported trans-1,2-dichloroethene. It should be noted that EPA Test Method 601 only lists the trans isomer.

TABLE 5

CONDUCTIVITY AND CHLORIDE RESULTS

Sample Identification	Conductivity (umhos/cm)	Chlorides (mg/L)
2D	3700	
4S	700	
7D	4200	2424
10S	850	152
13D	900	
14S		152
WH	950	
Storm Drain 1	900	
Storm Drain 2	700	

Notes: Samples collected April 28 and 29, 1988.

Conductivity meter was not calibrated.

Storm Drain 1 located between Wells 12S and 3S

Storm Drain 2 located adjacent to Well 14S

APPENDIX A

Geologic Logs

GEOLOGIC LOGS OF MONITOR WELL 1S AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1.0	1.0	SAND AND HUMUS - Sand, 60%, colorless, quartz, fine- to medium-grained, sub-angular to sub-rounded; Humus, 40%, dusky brown, pliable.
1.0 - 2.5	1.5	CLAY - Clay, 100%, moderate yellowish brown, pliable, sandy.
2.5 - 4.5	2.0	LIMESTONE - Limestone, 100%, very pale orange to grayish orange, moderately well cemented, sucrosic.
4.5 - 8.0	3.5	LIMESTONE - Limestone, 100%, very pale orange, well cemented, sucrosic in part.
8.0 - 11.5	3.5	LIMESTONE - Limestone, 100%, very pale orange to grayish orange, well cemented, sucrosic.
11.5 - 16.0	4.5+	LIMESTONE - Limestone, 100%, very pale orange, well cemented, sucrosic in part.

TOTAL DEPTH: 16.0

GEOLOGIC LOGS
OF
MONITOR WELL 2D
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1.0	1.0	SAND AND HUMUS - Sand, 50%, colorless, quartz, fine- to medium-grained, sub-angular to sub-rounded; Humus, 50%, dusky brown, pliable.
1.0 - 8.0	7.0	LIMESTONE - Limestone, 100%, very pale orange, moderately well cemented, granular.
8.0 - 9.0	1.0	SAND - Sand, 60%, very pale orange, calcareous, medium-grained, sucrosic; Sand, 40%, frosted, quartz, fine- to medium-grained, sub-angular.
9.0 - 27.0	18.0	LIMESTONE - Limestone, 100%, very pale orange, poorly to moderately well cemented, granular.
27.0 - 31.0	4.0	LIMESTONE - Limestone, 100%, very pale orange to yellowish gray, poorly to well cemented, granular in part, clayey.
31.0 - 35.0	4.0+	SILTY LIMESTONE - Limestone, 100%, very pale orange to yellowish gray, poorly cemented, silty.

TOTAL DEPTH: 35.0

GEOLOGIC LOGS
OF
MONITOR WELL 3S
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 0.5	0.5	SAND AND HUMUS - Sand, 60%, colorless, quartz, fine- to medium-grained, sub-angular to sub-rounded; Humus, 40%, dusky brown, pliable.
0.5 - 2.0	1.5	LIMESTONE - Limestone, 100%, very pale orange to grayish orange, friable to moderately well cemented, sucrosic in part.
2.0 - 8.0	6.0	LIMESTONE - Limestone, 100%, very pale orange, well cemented, sucrosic in part.
8.0 - 9.5	1.5	LIMESTONE WITH SAND - Limestone, 80%, very pale orange, friable; Sand, 20%, frosted, quartz, medium-grained, sub-rounded to sub-angular; Shell, trace, fragments.
9.5 - 14.0	4.5	LIMESTONE - Limestone, 100%, very pale orange, well cemented, sucrosic in part.
14.0 - 16.0	2.0+	SAND AND LIMESTONE - Sand, 60%, frosted, quartz, medium-grained, sub-rounded to sub-angular; Limestone, 40%, very pale orange, friable, sucrosic in part.

TOTAL DEPTH: 16.0

GEOLOGIC LOGS OF MONITOR WELL 4S AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 2.0	2.0	LIMESTONE WITH SAND - Limestone, 80%, grayish orange, moderately well cemented; Sand, 20%, colorless, quartz, fine-grained; Organics, trace.
2.0 - 4.0	2.0	LIMESTONE WITH SAND - Limestone, 75%, very pale orange, moderately well cemented; Sand, 25%, colorless, quartz, sub-angular.
4.0 - 11.0	7.0	LIMESTONE WITH SAND - Limestone, 80%, very pale orange, friable to moderately well cemented; Sand, 20%, colorless, quartz, fine- to medium-grained, sub-angular.
11.0 - 14.0	3.0	LIMESTONE AND CALCAREOUS SANDY CLAY-Limestone, 60%, very pale orange, moderately well cemented; Clay, 40%, very pale orange, calcareous, sandy, semi-plastic.
14.0 - 15.0	1.0+	LIMESTONE WITH SANDY CLAY -Limestone, 80%, very pale orange, well cemented, calcareous; Clay, sandy, 20%, very pale orange, sandy, semi-plastic.

TOTAL DEPTH: 15.0

GEOLOGIC LOGS OF MONITOR WELL 5S AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 3.0	3.0	LIMESTONE WITH SAND - Limestone, 80%, grayish orange, moderately well cemented; Sand, 20%, colorless, quartz, fine-grained; Organics, trace.
3.0 - 4.0	1.0	LIMESTONE WITH SAND - Limestone, 80%, very pale orange, well cemented; Sand, 20%, colorless, quartz, sub-angular.
4.0 - 5.0	1.0	LIMESTONE WITH SAND - Limestone, 80%, grayish orange, moderately well cemented; Sand, 20%, colorless, quartz, fine- to medium-grained.
5.0 - 12.0	7.0	LIMESTONE WITH SAND - Limestone, 70%, very pale orange, friable in part; Sand, 30%, colorless, quartz, fine- to medium-grained, sub-angular.
12.0 - 13.0	1.0	SAND - Sand, 80%, very pale orange to grayish orange, calcareous, medium-grained, sub-rounded, sucrosic; Sand, 20%, colorless, quartz, fine- to medium-grained; Clay, trace.
13.0 - 14.0	1.0	CALCAREOUS SANDSTONE - Sandstone, 85%, grayish orange, friable to moderately well cemented; Shell, 15%, grayish orange, sucrosic.
14.0 - 15.0	1.0+	LIMESTONE WITH CALCAREOUS CLAY- Limestone, 60%, very pale orange, moderately well cemented; Clay, 40%, very pale orange, plastic; Sand, trace; Shell, trace.

TOTAL DEPTH: 15.0

GEOLOGIC LOGS
OF
MONITOR WELL 6S
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1.5	1.5	LIMESTONE - Limestone, 100%, very pale orange to grayish orange, moderately well cemented, granular.
1.5 - 6.0	5.5	LIMESTONE - Limestone, 100%, very pale orange, moderately well cemented to friable, granular.
6.0 - 6.5	0.5	LIMESTONE AND SAND - Limestone, 60%, very pale orange, friable, sucrosic; Sand, 40%, frosted, quartz, medium-grained, sub-angular to sub-rounded.
6.5 - 16.0	9.5+	LIMESTONE - Limestone, 100%, very pale orange, moderately well cemented, granular in part.

TOTAL DEPTH: 16.0

GEOLOGIC LOGS
OF
MONITOR WELL 7D
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 0.5	0.5	SAND WITH HUMUS - Sand, 70%, colorless, quartz, fine- to medium-grained, sub-rounded to sub-angular; Humus, 30%, grayish brown, pliable.
0.5 - 2.0	1.5	LIMESTONE - Limestone, 100%, very pale orange to dark yellowish brown, friable to moderately well cemented.
2.0 - 4.0	2.0	LIMESTONE - Limestone, 100%, very pale orange, moderately well cemented, granular.
4.0 - 20.0	16.0	LIMESTONE - Limestone, 100%, very pale orange, well cemented, granular.
20.0 - 23.0	3.0	No Sample
23.0 - 24.5	1.5	SANDY OOLITIC LIMESTONE - Limestone, 60%, very pale orange, moderately well cemented; Sand, 20%, colorless, quartz, fine- to medium-grained, poorly sorted, sub-rounded; Oolites, 20%, white to very pale orange, fine-grained, sand-sized, round.
24.5 - 27.0	2.5	SANDY OOLITIC LIMESTONE - Limestone, 80%, very pale orange to pinkish gray, moderately well cemented; Sand, 10%, colorless, quartz, very fine- to medium-grained, poorly sorted, sub-rounded to sub-angular; Oolites, 10%, white to very pale orange, fine-grained, sand-sized, round.

Depth Interval (feet)	Thickness (feet)	Sample Description
27.0 - 30.5	3.5	SANDY LIMESTONE - Limestone, 80%, very pale orange, well cemented; Sand, 20%, colorless, quartz, medium-grained, rounded to sub-rounded, moderately well sorted.
30.5 - 35.0	4.5+	SAND WITH SANDY LIMESTONE - Sand, 70%, colorless, quartz, fine- to medium-grained, poorly sorted, sub-rounded to sub-angular; Limestone, 30%, very pale orange, very fine- to medium-grained, poorly cemented, sandy.

TOTAL DEPTH: 35.0

GEOLOGIC LOG
OF
MONITOR WELL 10S
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	TOPSOIL - Topsoil, 100%, grayish brown.
1 - 2	1	SANDSTONE AND CLAY - Calcareous Sandstone, 50%, calcareous, very pale orange to dark yellowish orange, moderately well cemented; Clay, 50%, very pale orange, calcareous, non-pliable.
2 - 6	4	SANDSTONE WITH CLAY - Calcareous Sandstone, 80%, calcareous very pale orange, moderately well cemented, abundant quartz grains, sub-angular; Clay, 20%, very pale orange, calcareous, non-pliable.
6 - 8	2	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, well cemented, abundant quartz grains, angular; Clay, trace.
8 - 9	1	SAND WITH SANDSTONE - Sand, 70%, calcareous, very pale orange, quartz and calcareous sand, sub-angular, medium-grained; Calcareous Sandstone, 30%, very pale orange, poorly cemented, abundant quartz grains, sub-angular.
9 - 12	3	SANDSTONE WITH CLAY - Sandstone, 65%, calcareous, very pale orange, moderately well cemented, mostly calcareous, oolitic like grains; Clay, 35%, very pale orange, calcareous, non-pliable.

Interval (feet)	Thickness (feet)	Sample Description
12 - 13	1	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, moderately well cemented, abundant quartz with calcareous grains, sub-rounded.
13 - 14	1	SANDSTONE WITH CLAY - Sandstone, 75%, calcareous, very pale orange, well cemented, oolitic; Clay, 25%, very pale orange, calcareous, non-pliable.
14 - 16	2+	CALCAREOUS SAND - Sand, 100%, calcareous, very pale orange to dark yellowish orange, quartz and calcareous grains, sub-angular, sucrosic.

TOTAL DEPTH: 16

GEOLOGIC LOG
OF
MONITOR WELL 11S
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 2	2	SANDSTONE WITH SILT - Sandstone, 70%, very pale orange, quartz and calcareous grains, sub-angular, poorly cemented; Silt, 30%, very pale orange, calcareous.
2 - 3.5	1.5	SANDSTONE AND SAND - Sandstone, 60%, very pale orange to dusky yellowish brown, quartz and calcareous grains, sub-rounded, quartz grains, poorly to moderately well cemented, oolitic; Sand, 40%, colorless to very pale orange, quartz and calcareous, fine- to medium-grained, sub-angular.
3.5 - 6	2.5	SANDSTONE WITH SAND - Sandstone, 80%, very pale orange, quartz and calcareous grains, quartz grains, sub-rounded, moderately well cemented; Sand, 20%, colorless to very pale orange, quartz and calcareous, fine- to medium-grained, sub-angular; Chert, trace.
6 - 8	2	SANDSTONE WITH SAND - Sandstone, 80%, light gray to medium light gray, quartz and calcareous grains, quartz grains, sub-rounded, moderately well cemented; Sand, 20%, colorless to light gray, quartz and calcareous, fine- to medium-grained, sub-angular.
8 - 8.5	0.5	SAND- Sand, 100%, light to medium gray, quartz and calcareous, fine- to medium-grained, sub-rounded.

Depth Interval (feet)	Thickness (feet)	Sample Description
8.5 - 12	3.5	SANDSTONE WITH SAND - Sandstone, 80%, light to medium gray, quartz and calcareous grains, sub-rounded, quartz grains, moderately well cemented, oolitic; Sand, 20%, colorless to light gray, quartz and calcareous, fine- to medium-grained, sub-angular.
12 - 13	1	SAND - Sand, 100%, medium to dark gray, quartz and calcareous, fine- to medium-grained, sub-angular to sub-rounded.
13 - 15	2	SANDSTONE WITH SAND - Sandstone, 85%, medium to dark gray, quartz and calcareous grains, sub-rounded, quartz grains, moderately well cemented; Sand, 15%, medium to dark gray, quartz and calcareous, fine- to medium-grained, sub-angular.
15 - 16	1+	SANDSTONE- Sandstone, 100%, light gray, quartz and calcareous grains, quartz grains, sub-rounded to rounded, moderately to well cemented.

TOTAL DEPTH: 16

GEOLOGIC LOG
OF
SOIL BORING 11S
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 2	2	TOPSOIL - Topsoil, 100%, ducky brown.
2 - 4	2	SANDSTONE AND SAND - Sandstone, 50%, very pale orange, quartz and calcareous grains, oolitic, rounded, quartz grains, moderately well cemented; Sand, 50%, colorless to very pale orange, quartz and calcareous, fine-grained.
4 - 10	6	SANDSTONE WITH SAND - Sandstone, 85%, very pale orange, quartz and calcareous grains, oolitic, rounded, quartz grains, moderately to well cemented; Sand, 15%, colorless to very pale orange, quartz and calcareous, fine- to medium-grained; Clay, trace.
10 - 13	3	SANDSTONE AND SAND - Sandstone, 50%, very pale orange, quartz and calcareous grains, oolitic, sub-rounded to rounded, quartz grains, poorly cemented; Sand, 50%, colorless to very pale orange, quartz and calcareous, sucrosic, fine-to medium-grained.
13 - 16	3+	SANDSTONE WITH SAND - Sandstone, 70%, very pale orange, quartz and calcareous grains, oolitic, sub-rounded, quartz grains, well cemented; Sand, 30%, colorless to very pale orange, quartz and calcareous, sucrosic, fine- to medium-grained; Clay, trace.

TOTAL DEPTH : 16

GEOLOGIC LOG
OF
MONITOR WELL 12S
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	SAND WITH CLAY - Sand, 70%, moderate brown to very pale orange, some shell fragments visible; Clay, 30%, very pale orange, calcareous; quartz, trace.
1 - 2	1	LIMESTONE WITH CLAY AND SAND- Limestone, 60%, very pale orange, sparitic; Clay, 25%, calcareous, very pale orange, non-pliable; Sand, 15%, quartz and calcareous, dusky brown.
2 - 2.5	.5	SANDSTONE WITH CLAY - Sandstone, 75%, calcareous, very pale orange to dark yellowish orange, abundant quartz, sub-rounded grains in calcareous cement, some shell fragments visible, well cemented; Calcareous Clay, 25%, very pale orange, non-pliable.
2.5 - 4.0	1.5	SANDSTONE WITH CLAY - Sandstone, 85%, calareous, very pale orange to dark yellowish orange, abundant quartz, sub-rounded grains in calcareous cement, some shell fragments visible, well cemented; Clay, calcareous, 15%, very pale orange, non-pliable.
4.0 - 7.5	3.5	SANDSTONE - Sandstone, 90%, calcareous, very pale orange, quartz grains, well rounded, oolitic like, moderately well cemented; Clay, 10%, calcareous, very pale orange, non-pliable.

Depth Interval (feet)	Thickness (feet)	Sample Description
7.5 - 8.5	1	SANDSTONE WITH SAND - Sandstone, 70%, calcareous, very pale orange, quartz grains, well rounded, oolitic, moderately well cemented; Sand, 30%, colorless and very pale orange, quartz and calcareous sand, sub-rounded; Clay, trace.
8.5 - 13	4.5	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, quartz grains, well rounded, oolitic, moderately to well cemented; Sand, trace.
13 - 14	1	SANDSTONE WITH SAND - Sandstone, 60%, calcareous, very pale orange, quartz grains, well rounded, oolitic, poorly cemented; Sand, 40%, colorless and very pale orange, quartz and calcareous sand, sub-rounded; Clay, trace.
14 - 16	2+	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, quartz grains, well rounded, oolitic, well cemented; Sand, trace.

TOTAL DEPTH: 16

GEOLOGIC LOG
OF
MONITOR WELL 13D
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	LIMESTONE WITH CLAY AND SAND- Limestone, 70%, tan, well cemented; Clay, 30%, calcareous, tan, non-pliable.
1 - 3	2	CLAY SANDSTONE - Clay, 50%, pale yellowish orange to dark yellowish orange, arenaceous, non-pliable; Sandstone, 50%, calcareous, pale yellowish orange, well cemented.
3 - 4	1	LIMESTONE WITH CLAY - Limestone, 95%, very pale orange, arenaceous, well cemented; Clay, 5%, very pale orange, non-pliable.
4 - 8	4	SANDSTONE WITH CLAY - Sandstone, 90%, calcareous, very pale orange, moderately well cemented; Clay, 10%, calcareous, very pale orange, non-pliable.
8 - 14	6	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, moderately well cemented, oolitic.
14 - 15	1	SANDSTONE WITH CLAY - Sandstone, 90%, calcareous, very pale orange, poorly cemented to moderately well cemented, oolitic; Clay, 10%, very pale orange, non-pliable.
15 - 18	3	No sample.
18 - 20	2	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, medium-grained, poorly cemented; Clay, trace, very pale orange.

Depth Interval (Feet)	Thickness (feet)	Sample Description
20 - 23	3	No sample.
23 - 25	2	SANDSTONE - Sandstone, 100%, calcareous, very pale orange, fine- to medium-grained, well cemented; Clay, trace, very pale orange.
25 - 28	3	No Sample.
28 - 29.5	1.5	SANDSTONE WITH CLAY - Sandstone, 80%, calcareous, very pale orange to medium light gray, medium-grained, well cemented; Clay, 20%, very pale orange.
29.5 - 30	0.5	LIMESTONE WITH CLAY - Limestone, 80%, very pale orange, fossiliferousd, coral with sparry calcite, well cemented; Clay, 20%, very pale orange, non-pliable.
30 - 33	3	No Sample.
33 - 35	2+	SAND - Sand, 100%, calcareous, yellowish gray, quartz, medium-grained, densely packed.

TOTAL DEPTH: 35

GEOLOGIC LOG OF MONITOR WELL 14S AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	SANDSTONE WITH CLAY - Sandstone, 80%, calcareous, very pale orange, quartz in calcite cement, medium- to fine-grained, quartz, sub-angular; Clay, 20%, very pale orange, calcareous, non-pliable.
1 - 2	1	SANDSTONE AND CLAY - Sandstone, 50%, very pale orange to dark yellowish orange, quartz and calcareous grains, medium- to fine-grained, quartz, sub-rounded; Clay, 50%, dark yellowish orange, calcareous, non-pliable.
2 - 7	5	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous sand, quartz grains, medium- to fine-grained, sub-angular; Clay, trace.
7 - 9	2	SAND - Sand, 100%, very pale orange to dark yellowish orange, quartz and calcareous sand, sub-angular, quartz grains, medium- to fine-grained.
9 - 10	1	SANDSTONE WITH SAND - Sandstone, 80%, very pale orange, quartz and calcareous sand, quartz grains, medium- to fine-grained, sub-rounded; Sand, 20%, very pale orange, calcareous.
10 - 11	1	SAND - Sand, 100%, very pale orange, quartz and calcareous sand, sub-angular, medium- to fine-grained.

Depth Interval (feet)	Thickness (feet)	Sample Description
11 - 12	1	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous sand, well cemented.
12 - 12.5	.5	SAND - Sand, 100%, very pale orange, mostly calcareous, sparitic.
12.5 - 14	1.5	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous sand, well cemented; Clay, trace.
14 - 15	1	SANDSTONE AND SAND - Sandstone, 50%, very pale orange, quartz and calcareous sand, well cemented; Sand, 50%, very pale orange to dark yellowish orange, mostly calcareous.
15 - 16	1+	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous grains, well cemented.

TOTAL DEPTH: 16

GEOLOGIC LOG OF MONITOR WELL 15S AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	TOPSOIL AND LIMESTONE - Topsoil, 65%, dusky brown; Limestone, 35%, very pale orange, micritic, some shell fragments visible, moderately well cemented.
1 - 2	1	SANDSTONE AND SAND - Sandstone, 60%, grayish orange, quartz and calcareous grains, sub-angular, quartz, moderately to well cemented; Sand, 40%, colorless to very pale orange, quartz and calcareous, fine- to medium-grained; Clay, trace.
2 - 6	4	SANDSTONE WITH SAND - Sandstone, 75%, very pale orange, quartz and calcareous grains, quartz grains, sub-rounded to rounded, moderately well cemented; Sand, 25%, colorless and very pale orange, quartz and calcareous, sub-rounded.
6 - 9	3	SANDSTONE AND SAND - Sandstone, 55%, very pale orange, quartz and calcareous grains, quartz grains, sub-rounded, poorly cemented; Sand, 45%, colorless to very pale orange, quartz and calcareous, sub-angular to sub-rounded.
9 - 12	3	SANDSTONE WITH SAND - Sandstone, 85%, very pale orange, quartz and calcareous grains, quartz grains, sub-rounded to rounded, moderately to well cemented; Sand, 15%, colorless to very pale orange, quartz and calcareous, sub-angular to sub-rounded; Clay, trace.

Depth Interval (feet)	Thickness (feet)	Sample Description
12 - 16	4+	SANDSTONE AND SAND - Sandstone, 55%, very pale orange to dusky yellowish orange, quartz and calcareous grains, quartz grains, sub-rounded, poorly cemented; Sand, 45%, colorless to very pale orange, quartz and calcareous, sub-angular, sucrosic; Clay, trace.

TOTAL DEPTH: 16

GEOLOGIC LOG
OF
SOIL SAMPLE I
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	No sample.
1 - 2	1	CLAY - Clay, 100%, very pale orange to dark yellowish orange, non-pliable.
2 - 6	4	SANDSTONE WITH CLAY - Sandstone, 80%, very pale orange, quartz and calcareous grains, oolitic, sub-angular to rounded, quartz grains, moderated well cemented; Clay, 20%, very pale orange, calcareous, non-pliable.
6 - 8	2	SANDSTONE WITH SAND - Sandstone, 85%, very pale orange, quartz and calcareous grains, oolitic, sub-angular to rounded, quartz grains, poorly to moderately well cemented; Sand, 15%, colorless to very pale orange, quartz and calcareous, sucrosic.
8 - 10	2	SAND AND SANDSTONE - Sand, 55%, colorless to very pale orange, quartz and calcareous; Sandstone, 45%, very pale orange to dark yellowish orange, quartz and calcareous grains, oolitic, moderately well cemented.
10 - 14	4+	SANDSTONE WITH SAND - Sandstone, 80%, very pale orange to dark yellowish orange, quartz and calcareous grains, oolitic, moderately to well cemented; Sand, 20%, colorless to very pale orange, quartz and calcareous, sub-rounded to rounded.

TOTAL DEPTH; 14

GEOLOGIC LOG
OF
SOIL SAMPLE II
AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	No sample.
1 - 2	1	CLAY AND SANDSTONE WITH TOPSOIL- Clay, 40%, calcareous, very pale orange, non-pliable; Sandstone, 40%, very pale orange to dark yellowish orange, quartz and calcareous grains, moderately well cemented; Topsoil, 20%, grayish brown.
2 - 3	1	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous grains, oolitic, sub-rounded to rounded quartz grains, well cemented.
3 - 10	7	SANDSTONE WITH SAND - Sandstone, 80%, very pale orange, quartz and calcareous grains, quartz grains, sub-angular, poorly cemented; Sand, 20%, colorless to very pale orange, quartz and calcareous, sub-angular to sub-rounded.
10 - 12	2	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous grains, quartz grains, sub-angular, poorly to moderately well cemented.
12 - 14	2+	SANDSTONE AND SAND - Sandstone, 60%, very pale orange, quartz and calcareous grains, sub-angular, quartz grains, poorly cemented; Sand, 40%, colorless to very pale orange, quartz and calcareous, sub-angular.

TOTAL DEPTH: 14

GEOLOGIC LOG OF SOIL SAMPLE III AMERICAN DADE, MIAMI, FLORIDA

Depth Interval (feet)	Thickness (feet)	Sample Description
0 - 1	1	No Sample.
1 - 2	1	SANDSTONE AND CLAY - Sandstone, 80%, very pale orange to dark yellowish orange, quartz and calcareous grains, quartz grains, sub-angular, moderately to well cemented; Clay, 20%, very pale orange, calcareous, non-pliable.
2 - 6	4	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous grains, oolitic, quartz grains, sub-angular to rounded, moderately to well cemented.
6 - 8	2	SANDSTONE WITH SAND - Sandstone, 85%, very pale orange, quartz and calcareous grains, oolitic, quartz grains, sub-angular to rounded, poorly cemented; Sand, 15%, colorless to very pale orange, quartz and calcareous, sucrosic.
8 - 10	2+	SANDSTONE - Sandstone, 100%, very pale orange, quartz and calcareous grains, oolitic, quartz grains are sub-angular to rounded, well cemented.

TOTAL DEPTH: 10

APPENDIX B1

Laboratory Reports, 1988

Soils

Pioneer LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client:	GERAGHTY & MILLER, INC.	Lab I.D.#:	88-1299
07039	2700 PGA BOULEVARD	Order Number:	P12092
	SUITE 104	Order Date:	04/15/88
	PALM BEACH GARDENS, FL 33410-0000	Sampled By:	M. PIJNENBURG
		Sample Date:	04/14/88
		Sample Time:	1300

Project Number: PF1148AD01
Project Name: GERAGHTY & MILLER
Sample Site: MIAMI, FLORIDA
Sample Type: SOIL, EP TOX

N/S = NOT SUBMITTED

R E S U L T S

reported on the following page(s)

Comments: PPM = Parts Per Million, mg/l; PPB = Parts Per Billion, ug/kg
BDL = Below Detection Limit. Method Reference: SW-846, 3rd Edition, November 1986.

Approved By: W. F. Bowen

Pioneer LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER, INC.
07039

Lab I.D.#: 88-1299
Order Date: 04/15/88
Sampled By: M. PIJNENBURG
Sample Date: 04/14/88
Sample Time: 1300

Sample Site: MIAMI, FLORIDA
Sample Type: SOIL, EP TOX

Parameter	Units	I 1-2 88-1299-1	II 1-2 88-1299-2	III 1-2 88-1299-3	I 2-3 88-1299-4	Detection Limit
CHROMIUM	PPM	BDL	BDL	BDL	BDL	0.5
MERCURY	PPM	BDL	BDL	BDL	BDL	0.01
LEAD	PPM	BDL	BDL	BDL	BDL	0.5

Parameter	Units	II 2-3 88-1299-5	III 2-3 88-1299-6	IV 2-3 88-1299-7	I 3-4 88-1299-8	Detection Limit
CHROMIUM	PPM	BDL	BDL	BDL	BDL	0.5
MERCURY	PPM	BDL	BDL	BDL	BDL	0.01
LEAD	PPM	BDL	BDL	BDL	BDL	0.5

Parameter	Units	II 3-4 88-1299-9	Detection Limit
CHROMIUM	PPM	BDL	0.5
MERCURY	PPM	BDL	0.01
LEAD	PPM	BDL	0.5

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client:	GERAGHTY & MILLER	Lab I.D.#:	88-1822
07039	2700 PGA BLVD	Order Number:	P12828
	SUITE 104	Order Date:	05/23/88
	PALM BEACH GD FL 33410-0000	Sampled By:	D. LOESER
		Sample Date:	04/14/88
		Sample Time:	N/S

Project Number: PF11408AD01
Project Name: GERAGHTY & MILLER, INC.
Sample Site: N/S
Sample Type: SOIL

N/S = Not Submitted

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
88-1822-1	III 3'-4'	CR,EPTOX	PPM	BDL	0.50
88-1822-1	III 3'-4'	MERCURY,EPTOX	PPM	BDL	0.01
88-1822-1	III 3'-4'	LEAD,EPTOX	PPM	BDL	0.50

Comments: PPM = Parts Per Million, mg/l; BDL = Below Detection Limit.
Method Reference: SW-846, 3rd Edition, November 1986.

Approved By : W. F. Bowers

 end of report

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER, INC.
07039

Sample Site: MIAMI, FLORIDA
Sample Type: SOIL, EP TOX

Lab I.D.#: 88-1299
Order Date: 04/15/88
Sampled By: M. PIJNENBURG
Sample Date: 04/14/88
Sample Time: 1300

VOLATILE/8010 & 8020 VOLATILE METHOD 8010 & 8020

Parameter	Units	I 1-2 88-1299-1	II 1-2 88-1299-2	III 1-2 88-1299-3	I 2-3 88-1299-4	Detection Limit
BENZENE	PPB	BDL	BDL	BDL	BDL	1
BROMODICHLORMETHANE	PPB	BDL	BDL	BDL	BDL	3
BROMOFORM	PPB	BDL	BDL	BDL	BDL	3
BROMOMETHANE	PPB	BDL	BDL	BDL	BDL	3
CARBON TETRACHLORIDE	PPB	BDL	BDL	BDL	BDL	2
CHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	1
CHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
CHLOROFORM	PPB	BDL	BDL	BDL	BDL	3
CHLOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
CIS-1,3-DICHLOROPROPENE	PPB	BDL	BDL	BDL	BDL	3
DIBROMOCHLOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
DICHLORODIFLUOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
ETHYLBENZENE	PPB	BDL	BDL	BDL	BDL	1
METHYLENE CHLORIDE	PPB	BDL	BDL	BDL	BDL	3
TETRACHLOROETHENE	PPB	BDL	BDL	BDL	BDL	3
TOLUENE	PPB	BDL	27	BDL	BDL	1
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	BDL	BDL	BDL	3
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	BDL	BDL	BDL	3
TRICHLOROETHENE	PPB	BDL	6	BDL	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
VINYL CHLORIDE	PPB	BDL	BDL	BDL	BDL	1
XYLENE	PPB	BDL	BDL	BDL	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1,2-TRICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1-DICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	BDL	BDL	BDL	3
1,2-DICHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	3
1,2-DICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	2
1,2-DICHLOROPROPANE	PPB	BDL	BDL	BDL	BDL	3
1,3-DICHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	3
1,4-DICHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	3
2-CHLOROETHYLVINYL ETHER	PPB	BDL	BDL	BDL	BDL	3

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER, INC.
07039

Lab I.D.#: 88-1299
Order Date: 04/15/88
Sampled By: M. PIJNENBURG
Sample Date: 04/14/88
Sample Time: 1300

Sample Site: MIAMI, FLORIDA
Sample Type: SOIL, EP TOX

VOLATILE/8010 & 8020 VOLATILE METHOD 8010 & 8020

Parameter	Units	II 2-3 88-1299-5	III 2-3 88-1299-6	IV 2-3 88-1299-7	I 3-4 88-1299-8	Detection Limit
BENZENE	PPB	BDL	BDL	BDL	BDL	1
BROMODICHLORMETHANE	PPB	BDL	BDL	BDL	BDL	3
BROMOFORM	PPB	BDL	BDL	BDL	BDL	3
BROMOMETHANE	PPB	BDL	BDL	BDL	BDL	3
CARBON TETRACHLORIDE	PPB	BDL	BDL	BDL	BDL	2
CHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	1
CHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
CHLOROFORM	PPB	BDL	BDL	BDL	BDL	3
CHLOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
CIS-1,3-DICHLOROPROPENE	PPB	BDL	BDL	BDL	BDL	3
DIBROMOCHLOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
DICHLORODIFLUOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
ETHYLBENZENE	PPB	BDL	BDL	BDL	BDL	1
METHYLENE CHLORIDE	PPB	BDL	BDL	BDL	BDL	3
TETRACHLOROETHENE	PPB	BDL	BDL	BDL	BDL	3
TOLUENE	PPB	BDL	BDL	BDL	BDL	1
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	BDL	BDL	BDL	3
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	BDL	BDL	BDL	3
TRICHLOROETHENE	PPB	3	BDL	BDL	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	BDL	BDL	BDL	3
VINYL CHLORIDE	PPB	BDL	BDL	BDL	BDL	1
XYLENE	PPB	BDL	BDL	BDL	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1,2-TRICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1-DICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	BDL	BDL	BDL	3
1,2-DICHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	3
1,2-DICHLOROETHANE	PPB	BDL	BDL	BDL	BDL	2
1,2-DICHLOROPROPANE	PPB	BDL	BDL	BDL	BDL	3
1,3-DICHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	3
1,4-DICHLOROBENZENE	PPB	BDL	BDL	BDL	BDL	3
2-CHLOROETHYLVINYL ETHER	PPB	BDL	BDL	BDL	BDL	3

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER, INC.
07039

Lab I.D.#: 88-1299
Order Date: 04/15/88
Sampled By: M. PIJNENBURG
Sample Date: 04/14/88
Sample Time: 1300

Sample Site: MIAMI, FLORIDA
Sample Type: SOIL, EP TOX

VOLATILE/8010 & 8020 VOLATILE METHOD 8010 & 8020

Parameter	Units	II 3-4 88-1299-9	III 3-4 88-1299-10	Detection Limit
BENZENE	PPB	BDL	BDL	1
BROMODICHLORMETHANE	PPB	BDL	BDL	3
BROMOFORM	PPB	BDL	BDL	3
BROMOMETHANE	PPB	BDL	BDL	3
CARBON TETRACHLORIDE	PPB	BDL	BDL	2
CHLOROBENZENE	PPB	BDL	BDL	1
CHLOROETHANE	PPB	BDL	BDL	3
CHLOROFORM	PPB	BDL	BDL	3
CHLOROMETHANE	PPB	BDL	BDL	3
CIS-1,3-DICHLOROPROPENE	PPB	BDL	BDL	3
DIBROMOCHLOROMETHANE	PPB	BDL	BDL	3
DICHLORODIFLUOROMETHANE	PPB	BDL	BDL	3
ETHYLBENZENE	PPB	BDL	BDL	1
METHYLENE CHLORIDE	PPB	BDL	BDL	3
TETRACHLOROETHENE	PPB	BDL	BDL	3
TOLUENE	PPB	BDL	BDL	1
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	BDL	3
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	BDL	3
TRICHLOROETHENE	PPB	4	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	BDL	3
VINYL CHLORIDE	PPB	BDL	BDL	1
XYLENE	PPB	BDL	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	BDL	3
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	BDL	3
1,1,2-TRICHLOROETHANE	PPB	BDL	BDL	3
1,1-DICHLOROETHANE	PPB	BDL	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	BDL	3
1,2-DICHLOROBENZENE	PPB	BDL	BDL	3
1,2-DICHLOROETHANE	PPB	BDL	BDL	2
1,2-DICHLOROPROPANE	PPB	BDL	BDL	3
1,3-DICHLOROBENZENE	PPB	BDL	BDL	3
1,4-DICHLOROBENZENE	PPB	BDL	BDL	3
2-CHLOROETHYLVINYL ETHER	PPB	BDL	BDL	3

end of report

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client:	GERAGHTY & MILLER, INC.	Lab I.D.#:	88-1399
07039	2700 PGA BOULEVARD	Order Number:	P12220
	SUITE 104	Order Date:	04/25/88
	PALM BEACH GARDENS, FL 33410-0000	Sampled By:	M. PIJNENBURG
		Sample Date:	04/14/88
		Sample Time:	N/S

Project Number: PF1148AD01
Project Name: N/S
Sample Site: N/S
Sample Type: SEDIMENT

N/S = NOT SUBMITTED

R E S U L T S

reported on the following page(s)

Comments: PPB = Parts Per Billion, ug/kg on a dry basis.
Method Reference: SW-846, 3rd Edition, November 1986.
BDL = Below Detection Limit

Approved By: W. F. Bowers

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER, INC.
07039

Lab I.D.#: 88-1399-01
Order Date: 04/25/88
Sampled By: M. PIJNENBURG

Sample Site: N/S
Sample Type: SEDIMENT

Sample ID.: II 4-6 Sample Date: 04/14/88 Time: N/S

VOLATILE/8010 & 8020 VOLATILE METHOD 8010 & 8020

Parameter	Units	Results	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLORMETHANE	PPB	BDL	3
BROMOFORM	PPB	BDL	3
BROMOMETHANE	PPB	BDL	3
CARBON TETRACHLORIDE	PPB	BDL	2
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	3
CHLOROFORM	PPB	BDL	3
CHLOROMETHANE	PPB	BDL	3
CIS-1,3-DICHLOROPROPENE	PPB	BDL	3
DIBROMOCHLOROMETHANE	PPB	BDL	3
DICHLORODIFLUOROMETHANE	PPB	BDL	3
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	3
TETRACHLOROETHENE	PPB	BDL	2
TOLUENE	PPB	BDL	1
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	3
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	3
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	3
VINYL CHLORIDE	PPB	BDL	1
XYLENE	PPB	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	3
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	3
1,1,2-TRICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	3
1,2-DICHLOROBENZENE	PPB	BDL	3
1,2-DICHLOROETHANE	PPB	BDL	2
1,2-DICHLOROPROPANE	PPB	BDL	3
1,3-DICHLOROBENZENE	PPB	BDL	3
1,4-DICHLOROBENZENE	PPB	BDL	3
2-CHLOROETHYLVINYL ETHER	PPB	BDL	3

Pioneer LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER, INC.
07039

Lab I.D.#: 88-1399-02
Order Date: 04/25/88
Sampled By: M. PIJNENBURG

Sample Site: N/S
Sample Type: SEDIMENT

Sample ID.: II 6-8 Sample Date: 04/14/88 Time: N/S

VOLATILE/8010 & 8020 VOLATILE METHOD 8010 & 8020

Parameter	Units	Results	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLORMETHANE	PPB	BDL	3
BROMOFORM	PPB	BDL	3
BROMOMETHANE	PPB	BDL	3
CARBON TETRACHLORIDE	PPB	BDL	2
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	3
CHLOROFORM	PPB	BDL	3
CHLOROMETHANE	PPB	BDL	3
CIS-1,3-DICHLOROPROPENE	PPB	BDL	3
DIBROMOCHLOROMETHANE	PPB	BDL	3
DICHLORODIFLUOROMETHANE	PPB	BDL	3
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	3
TETRACHLOROETHENE	PPB	BDL	2
TOLUENE	PPB	BDL	1
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	3
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	3
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	3
VINYL CHLORIDE	PPB	BDL	1
XYLENE	PPB	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	3
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	3
1,1,2-TRICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	3
1,2-DICHLOROBENZENE	PPB	BDL	3
1,2-DICHLOROETHANE	PPB	BDL	2
1,2-DICHLOROPROPANE	PPB	BDL	3
1,3-DICHLOROBENZENE	PPB	BDL	3
1,4-DICHLOROBENZENE	PPB	BDL	3
2-CHLOROETHYLVINYL ETHER	PPB	BDL	3

 end of report

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039 2700 PGA BLVD
SUITE 104
PALM BEACH GD FL 33410-0000

Lab I.D.#: 88-1400
Order Number: P12221
Order Date: 04/25/88
Sampled By: M PIJNENBURG
Sample Date: 04/14/88
Sample Time: N/S

Project Number: PF1148AD01
Project Name: N/S
Sample Site: N/S
Sample Type: SEDIMENT

N/S = Not Submitted

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
88-1400-1	III 2-3	METHYL ETHYL KETONE	PPB	BDL	10
88-1400-1	III 2-3	METHYL ISOBUTYL KETONE	PPB	BDL	10

Comments: PPB = Parts Per Billion, ug/kg on a dry basis. BDL = Below Detection Limits. Method Reference: SW-846, 3rd Edition, November 1986.

Approved By : [signature]

end of report

Pioneer LABORATORY INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039 2700 PGA BLVD
SUITE 104
PALM BEACH GD FL 33410-0000

Lab I.D.#: 88-1459
Order Number: P12313
Order Date: 04/28/88
Sampled By: M.PIJNENBURG
Sample Date: 04/14/88
Sample Time: 1300

Project Number: PF1148AD01
Project Name: GERAGHTY & MILLER
Sample Site: N/S
Sample Type: SOIL

N/S = Not Submitted

Lab ID	Sample ID	Parameter	Units	Results	Detection Limit
88-1459-1	I 1-2	SILVER,EPTOX	PPM	BDL	0.50
88-1459-2	II 1-2	SILVER,EPTOX	PPM	BDL	0.50
88-1459-3	III 2-3	SILVER,EPTOX	PPM	BDL	0.50
88-1459-1	I 1-2	ARSENIC,EPTOX	PPM	BDL	0.50
88-1459-2	II 1-2	ARSENIC,EPTOX	PPM	BDL	0.50
88-1459-3	III 2-3	ARSENIC,EPTOX	PPM	BDL	0.50
88-1459-1	I 1-2	BARIUM,EPTOX	PPM	BDL	1.0
88-1459-2	II 1-2	BARIUM,EPTOX	PPM	BDL	1.0
88-1459-3	III 2-3	BARIUM,EPTOX	PPM	BDL	1.0
88-1459-1	I 1-2	CADMIUM,EPTOX	PPM	BDL	0.10
88-1459-2	II 1-2	CADMIUM,EPTOX	PPM	BDL	0.10
88-1459-3	III 2-3	CADMIUM,EPTOX	PPM	BDL	0.10
88-1459-1	I 1-2	SELENIUM,EPTOX	PPM	BDL	0.20
88-1459-2	II 1-2	SELENIUM,EPTOX	PPM	BDL	0.20
88-1459-3	III 2-3	SELENIUM,EPTOX	PPM	BDL	0.20

Comments: PPM = Parts Per Million, mg/kg on a dry basis; BDL = Below Detection Limits. Method Reference: SW-846, 3rd Edition, November 1986.

Approved By : Paul Canevaro

end of report

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
2700 PGA BLVD., SUITE 104
PALM BEACH GD., FLORIDA 33410

PROJECT NO: PF1148AD01

QC LEVEL I (INORGANIC)

LAB ID: 88-1299 EPTOX EXTRACTION

LAB ID	CLIENT ID
88-1299-1	I-1-2
88-1299-2	II-1-2
88-1299-3	III-1-2
88-1299-4	I-2-3
88-1299-5	II-2-3
88-1299-6	III-2-3
88-1299-7	IV-2-3
88-1299-8	I-3-4
88-1299-9	II-3-4
88-1299-10	III-3-4
88-1299-TB	TRIP BLANK

SOIL

PARAMETER	PREPARATION DATE	ANALYSIS DATE	BATCH #	METHOD	DETECTION LIMIT	BLANK RESULT	MATRIX SPIKE RESULT	EXPECTED MAT. SPK. RESULT	% REC. MATRIX SPIKE	% REC. CONTROL LIMITS
MERCURY	4/21/88	4/21/88	88-Hg-7	7470	0.01	BDL	0.52	0.62	84	76-128
LEAD	4/21/88	4/26/88	88-EPTOX-PbR-1	6010	0.50	BDL	2.06	2.03	101	96-108
CHROMIUM	4/21/88	4/26/88	88-EPTOX-CrR-1	6010	0.50	BDL	0.97	1.00	97	95-107

Notes: Results reported in ppm, parts per million, mg/l.
BDL = Below Detection Limit.
Results reported are blank corrected.

Source for control limits is internal laboratory quality assurance program and references below.

Reference: SW846, 3rd Edition, November 1986.

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
700 PCA BLVD., SUITE 104
PALM BEACH, FLORIDA 33410

PROJECT: PF1149AD01

Volatile Method 8010 & 8020

QC LEVEL I

LAB ID: 88 1299

LAB ID	CLIENT ID	ANALYSIS DATE	BATCH #
88-1299-1	I-1-2	4/20/88	JS-2
88-1299-2	II-1-2	4/20/88	JS-2
88-1299-3	III-1-2	4/20/88	JS-2
88-1299-4	I-2-3	4/20/88	JS-2
88-1299-5	II-2-3	4/20/88	JS-2
88-1299-6	III-2-3	4/20/88	JS-2
88-1299-7	IV-2-3	4/20/88	JS-2
88-1299-8	I-3-4	4/20/88	JS-2
88-1299-9	II-3-4	4/20/88	JS-2
88-1299-10	III-3-4	4/20/88	JS-2
88-1299-TB	TRIP BLANK	4/20/88	JS-2
SPIKE		4/20/88	JS-2
SPIKE DUP		4/20/88	JS-2
DI BLANK		4/20/88	JS-2

DI BLANK - ALL PARAMETERS BDL

REAGENT WATER SPIKE/SPIKE DUPLICATE RECOVERY

PARAMETER	SPIKE RESULT	SPIKE DUPLICATE RESULT	SPIKE EXPECTED VALUE	% REC. SPIKE	% REC. SPIKE DUPLICATE	% REC. CONTROL LIMITS	SPIKE RPD	MAXIMUM RPD
1,1-Dichloroethene	28	25	25	112	100	61-145	11	14
Trichloroethene	30	27	25	120	108	71-120	11	14
Benzene	27	25	25	[illegible]	100	76-127	8	11
Toluene	22	21	25	88	84	76-125	5	13
Chlorobenzene	25	24	25	100	96	75-130	4	13

Note: ppb = parts per billion, ug/l
BDL = below detection limits
Results reported are blank corrected.
Source for control limits is internal laboratory quality assurance program and the Federal Register (see below).

Reference: Federal Register, 40 CFR, Part 136, July 1, 1987.

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
2700 PGA BLVD., SUITE 104
PALM BEACH, FLORIDA 33410

PROJECT: PF1148AD01

Volatile Method: 8010 & 8020

QC LEVEL I

LAB ID: 88-1300

LAB ID	CLIENT ID	ANALYSIS DATE	BATCH #
88-1300-1	II 4-6	4/22/88	JS-2
88-1300-2	II 6-8	4/22/88	JS-2
SPIKE		4/22/88	JS-2
SPIKE DUP		4/22/88	JS-2
DI BLANK		4/22/88	JS-2

DI BLANK - ALL PARAMETERS BDL

REAGENT WATER SPIKE/SPIKE DUPLICATE RECOVERY

PARAMETER	SPIKE RESULT	SPIKE DUPLICATE RESULT	SPIKE EXPECTED VALUE	% REC. SPIKE	% REC. SPIKE DUPLICATE	% REC. CONTROL LIMITS	SPIKE RPD	MAXIMUM RPD
1,1-Dichloroethane	28	25	25	112	100	61-145	11	14
Trichloroethene	30	27	25	120	108	71-120	11	14
Benzene	27	25	25	108	100	76-127	8	11
Toluene	22	21	25	88	84	76-125	5	13
Chlorobenzene	25	24	25	100	96	75-130	4	13

Note: ppb = parts per billion, ug/l
BDL = below detection limits
Results reported are blank corrected.
Source for control limits is internal laboratory quality assurance program and the Federal Register (see below).

Reference: Federal Register, 40 CFR, Part 136, July 1, 1987.

Pioneer LABORATORY, INC.
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
2700 PGA BLVD., SUITE 104
PALM BEACH GD., FLORIDA 33410

PROJECT: PF1148AD01

Volatile Method:

QC LEVEL I

LAB ID:

LAB ID	CLIENT ID	ANALYSIS DATE	BATCH #
88-1400-1	III-2-3	4/26/88	VS-2
SPIKE		4/26/88	VS-2
SPIKE DUP		4/26/88	VS-2
DI BLANK		4/26/88	VS-2

DI BLANK - ALL PARAMETERS BDL

REAGENT WATER SPIKE/SPIKE DUPLICATE RECOVERY

PARAMETER	SPIKE RESULT	SPIKE DUPLICATE RESULT	SPIKE EXPECTED VALUE	% REC. SPIKE	% REC. SPIKE DUPLICATE	% REC. CONTROL LIMITS	SPIKE RPD	MAXIMUM RPD
1,1-Dichloroethene	44	45	50	88	90	61-145	2	14
Trichloroethene	47	46	50	94	92	71-120	2	14
Benzene	51	51	50	102	102	76-127	0	11
Toluene	53	49	50	106	98	76-125	8	13
Chlorobenzene	48	43	50	96	86	75-130	11	13

Note: ppb = parts per billion, ug/l
BDL = below detection limits
Results reported are blank corrected.
Source for control limits is internal laboratory quality assurance program and the Federal Register (see below).

Reference: Federal Register, 40 CFR, Part 136, July 1, 1987.

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
2700 PGA BLVD., SUITE 104
PALM BEACH, FLORIDA 33410

PROJECT NO: PF1148AD01

QC LEVEL I (INORGANIC)

LAB ID: 88-1459

LAB ID	CLIENT ID
88-1459-1	I 1-2
88-1459-2	II 1-2
88-1459-3	III 2-3

PARAMETER	PREPARATION DATE	ANALYSIS DATE	BATCH #	METHOD	DETECTION LIMIT	BLANK RESULT	MATRIX SPIKE RESULT	EXPECTED MAT. SPK. RESULT	% REC. MATRIX SPIKE	% REC. CONTROL LIMITS
SILVER	5/2/88	5/3/88	88-EPTOX-Ag-3	6010	0.50	BDL	1.90	2.00	95	88-112
ARSENIC	5/2/88	5/3/88	88-EPTOX-As-6	6010	0.50	BDL	2.10	2.00	105	82-108
BARIUM	5/2/88	5/3/88	88-EPTOX-Ba-5	6010	1.00	BDL	2.00	2.00	100	89-117
CADMIUM	5/2/88	5/3/88	88-EPTOX-Cd-5	6010	0.10	BDL	1.00	1.00	100	88-112
SELENIUM	5/2/88	5/3/88	88-EPTOX-Se-5	6010	0.20	BDL	1.90	2.00	97	84-110

ALL QC DATA WAS WITHIN ACCEPTABLE LIMITS.

Notes: Results reported in ppm, parts per million, mg/l.
BDL = Below Detection Limit.
Results reported are blank corrected.

Source for control limits is internal laboratory quality assurance program and references below.

Reference: SW-846, 3rd Edition, November 1986.

APPENDIX B2

Laboratory Reports, 1987

Water Quality

Orlando Laboratories, Inc.

P. O. Box 19127 • Orlando, Florida 32814 • 305/896-6645

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Doug Loeser
2700 PGA Blvd., Suite 104
Palm Beach Gardens, Fla. 33410

Report #: 49782 (3416)
Sampled by: Client(D. Leonard)
Date sampled: 07-22-87 @ 1300-1600 hrs.
Date received: 07-23-87
Date reported: 07-31-87

IDENTIFICATION: Samples identified as marked.

ORGANIC ANALYSES BY GAS CHROMATOGRAPHIC SCREENING

RESULTS OF ANALYSIS

PURGEABLE ORGANICS	1S	5S	WD	WC
Bromodichloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Bromoform	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Bromomethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Carbon Tetrachloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
2-Chloroethylvinyl ether	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloroform	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Dibromochloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dibromo-3-chloropropane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Dichlorodifluoromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
c,t-1,2-Dichloroethene	0.11	0.008	ND(0.001)	0.012
1,2-Dichloropropane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
cis-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
trans-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Methylene chloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2,2,-Tetrachloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Tetrachloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,1-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Trichloroethene	0.15	0.28	0.022	0.11
Trichlorofluoromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Vinyl chloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)

Results expressed in mg/l unless otherwise designated. < = Less Than. Our Florida Department of Health and Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Laboratory Manager

Quality Control

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Doug Loeser
2700 PGA Blvd., Suite 104
Palm Beach Gardens, Fla. 33410

Report #: 49782 (3416)
Sampled by: Client(D. Leonard)
Date sampled: 07-22-87 @ 1300-1600 hrs.
Date received: 07-23-87
Date reported: 07-31-87

IDENTIFICATION: Samples identified as marked.

ORGANIC ANALYSES BY GAS CHROMATOGRAPHIC SCREENING

RESULTS OF ANALYSIS

PURGEABLE ORGANICS	WE	4S	6S	7D
Bromodichloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Bromoform	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Bromomethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Carbon Tetrachloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
2-Chloroethylvinyl ether	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloroform	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Dibromochloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dibromo-3-chloropropane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Dichlorodifluoromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
c,t-1,2-Dichloroethene	0.012	0.068	0.22	0.046
1,2-Dichloropropane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
cis-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
trans-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Methylene chloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2,2,-Tetrachloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Tetrachloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,1-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Trichloroethene	0.013	0.029	0.26	0.003
Trichlorofluoromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Vinyl chloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)

Results expressed in mg/l unless otherwise designated. < = Less Than. Our Florida Department of Health and Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Laboratory Manager

Quality Control

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Doug Loeser
2700 PGA Blvd., Suite 104
Palm Beach Gardens, Fla. 33410

Report #: 49782 (3416)
Sampled by: Client(D. Leonard)
Date sampled: 07-22-87 @ 1300-1600 hrs.
Date received: 07-23-87
Date reported: 07-31-87

IDENTIFICATION: Samples identified as marked.

ORGANIC ANALYSES BY GAS CHROMATOGRAPHIC SCREENING

RESULTS OF ANALYSIS

PURGEABLE ORGANICS	7S	MWH	WF
Bromodichloromethane	ND(0.001)	ND(0.001)	ND(0.001)
Bromoform	ND(0.001)	ND(0.001)	ND(0.001)
Bromomethane	ND(0.001)	ND(0.001)	ND(0.001)
Carbon Tetrachloride	ND(0.001)	ND(0.001)	ND(0.001)
Chloroethane	ND(0.001)	ND(0.001)	ND(0.001)
2-Chloroethylvinyl ether	ND(0.001)	ND(0.001)	ND(0.001)
Chloroform	0.020	0.021	ND(0.001)
Chloromethane	ND(0.001)	ND(0.001)	ND(0.001)
Dibromochloromethane	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dibromo-3-chloropropane	ND(0.001)	ND(0.001)	ND(0.001)
Dichlorodifluoromethane	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethene	ND(0.001)	ND(0.001)	ND(0.001)
c,t-1,2-Dichloroethene	0.005	0.006	0.020
1,2-Dichloropropane	ND(0.001)	ND(0.001)	ND(0.001)
cis-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)
trans-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)
Methylene chloride	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2,2,-Tetrachloroethane	ND(0.001)	ND(0.001)	ND(0.001)
Tetrachloroethene	ND(0.001)	ND(0.001)	ND(0.001)
1,1,1-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
Trichloroethene	0.096	0.099	0.005
Trichlorofluoromethane	ND(0.001)	ND(0.001)	ND(0.001)
Vinyl chloride	ND(0.001)	ND(0.001)	ND(0.001)

Results expressed in mg/l unless otherwise designated. < = Less Than. Our Florida Department of Health and Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Laboratory Manager

Quality Control

Geraghty & Miller
Attn: Doug Loeser

07-31-87

QUALITY CONTROL DATA SHEET

DUPLICATES:

PARAMETER	% DIFFERENCE	DATE	ANALYST
1,3-Dichlorobenzene	5	07-30-87	E.P.
1,4-Dichlorobenzene	1	07-30-87	E.P.
Benzene	6	07-30-87	E.P.
Chloroform	2	07-30-87	E.P.
1,1-Dichloroethane	<1	07-30-87	E.P.

SPIKES:

PARAMETER	% RECOVERY	DATE	ANALYST
1,3-Dichlorobenzene	87/92	07-30-87	E.P.
1,4-Dichlorobenzene	87/88	07-30-87	E.P.
Benzene	94/88	07-30-87	E.P.
Chloroform	88/90	07-30-87	E.P.
1,1-Dichloroethane	86/86	07-30-87	E.P.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Laboratory Manager

Quality Control

Orlando Laboratories, Inc.

P. O. Box 19127 • Orlando, Florida 32814 • 305/896-6645

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Doug Loeser
2700 PGA Blvd., Suite 104
Palm Beach Gardens, Fla. 33410

Report #: 49779 (3409)
Sampled by: Client(D.Leonard)
Date sampled: 07-21-87 @ 1300-1800 hrs.
Date received: 07-22-87
Date reported: 07-30-87

IDENTIFICATION: Project #P1148AD1 Miami (AM.DADE).

ORGANIC ANALYSES BY GAS CHROMATOGRAPHIC SCREENING

RESULTS OF ANALYSIS

PURGEABLE ORGANICS	MW-WI	MW-WJ	MW-WK	MW-WL
Bromodichloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Bromoform	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Bromomethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Carbon Tetrachloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
2-Chloroethylvinyl ether	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloroform	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Chloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Dibromochloromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dibromo-3-chloropropane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Dichlorodifluoromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
c,t-1,2-Dichloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dichloropropane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
cis-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
trans-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Methylene chloride	ND(0.001)	ND(0.001)	0.074	ND(0.001)
1,1,2,2,-Tetrachloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Tetrachloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,1-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Trichloroethene	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Trichlorofluoromethane	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)
Vinyl chloride	ND(0.001)	ND(0.001)	ND(0.001)	ND(0.001)

Results expressed in mg/l unless otherwise designated. < = Less Than. Our Florida Department of Health and Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Martha Bork
Laboratory Manager

Marilyn [illegible]
Quality Control

REPORT OF ANALYSIS

Geraghty & Miller
Attn: Doug Loeser
2700 PGA Blvd., Suite 104
Palm Beach Gardens, Fla. 33410

Report #: 49779 (3409)
Sampled by: Client(D.Leonard)
Date sampled: 07-21-87 @ 1300-1800 hrs.
Date received: 07-22-87
Date reported: 07-30-87

IDENTIFICATION: Project #P1148AD1 Miami (AM.DADE).

ORGANIC ANALYSES BY GAS CHROMATOGRAPHIC SCREENING

RESULTS OF ANALYSIS

PURGEABLE ORGANICS	MW-3S	MW-2D	MW-WB
Bromodichloromethane	ND(0.001)	ND(0.001)	ND(0.001)
Bromoform	ND(0.001)	ND(0.001)	ND(0.001)
Bromomethane	ND(0.001)	ND(0.001)	ND(0.001)
Carbon Tetrachloride	ND(0.001)	ND(0.001)	ND(0.001)
Chloroethane	ND(0.001)	ND(0.001)	ND(0.001)
2-Chloroethylvinyl ether	ND(0.001)	ND(0.001)	ND(0.001)
Chloroform	ND(0.001)	ND(0.001)	ND(0.001)
Chloromethane	ND(0.001)	ND(0.001)	ND(0.001)
Dibromochloromethane	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dibromo-3-chloropropane	ND(0.001)	ND(0.001)	ND(0.001)
Dichlorodifluoromethane	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
1,2-Dichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
1,1-Dichloroethene	ND(0.001)	ND(0.001)	ND(0.001)
c,t-1,2-Dichloroethene	0.19	ND(0.001)	ND(0.001)
1,2-Dichloropropane	ND(0.001)	ND(0.001)	ND(0.001)
cis-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)
trans-1,3-Dichloropropene	ND(0.001)	ND(0.001)	ND(0.001)
Methylene chloride	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2,2,-Tetrachloroethane	ND(0.001)	ND(0.001)	ND(0.001)
Tetrachloroethene	ND(0.001)	ND(0.001)	ND(0.001)
1,1,1-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
1,1,2-Trichloroethane	ND(0.001)	ND(0.001)	ND(0.001)
Trichloroethene	0.019	ND(0.001)	ND(0.001)
Trichlorofluoromethane	ND(0.001)	ND(0.001)	ND(0.001)
Vinyl chloride	0.015	ND(0.001)	ND(0.001)

Results expressed in mg/l unless otherwise designated. < = Less Than. Our Florida Department of Health and Rehabilitative Service Identification Number is 83141.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Laboratory Manager

Quality Control

Geraghty & Miller
Attn: Doug Loeser

07-30-87

Report #: 49779 (3409)

QUALITY CONTROL DATA SHEET

DUPLICATES:

PARAMETER	% DIFFERENCE	DATE	ANALYST
Benzene	4	07-27-87	E.P.
Toluene	<1	07-27-87	E.P.
Ethylbenzene	<1	07-27-87	E.P.
Chloroform	6	07-27-87	E.P.
Trichloroethene	6	07-27-87	E.P.
Tetrachloroethane	9	07-27-87	E.P.

SPIKES:

PARAMETER	% RECOVERY	DATE	ANALYST
Benzene	92/96	07-27-87	E.P.
Toluene	88/88	07-27-87	E.P.
Ethylbenzene	110/110	07-27-87	E.P.
Chloroform	94/100	07-27-87	E.P.
Trichloroethene	108/114	07-27-87	E.P.
Tetrachloroethane	96/87	07-27-87	E.P.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Martha Booth
Laboratory Manager

Quality Control

APPENDIX B3

Laboratory Reports, 1988

Water Quality

Pioneer
PLI LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA FLORIDA 32514
PHONE (904) 474-1001

RECEIVED
JUN 6 1988
Geraghty & Miller, Inc.

Client:	GERAGHTY & MILLER	Lab I.D.#:	88-1524
07039	2700 PGA BLVD	Order Number:	P12400
	SUITE 104	Order Date:	04/30/88
	PALM BEACH GD FL 33410-0000	Sampled By:	D. ALM
		Sample Date:	4/28-29
		Sample Time:	N/S

Project Number: PF1148AD01
Project Name: GERAGHTY & MILLER
Sample Site: N/S
Sample Type: GROUNDWATER

N/S = Not Submitted

R E S U L T S

reported on the following page(s)

Comments: Method Reference: Federal Register 40 CFR Part 136, July 1, 1987.
PPB = Parts Per Billion, ug/l; BDL = Below Detection Limit

Approved By : W. F. Bowers

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-1
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: WK Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

Pioneer LABORATORY, INC
1 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-2
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 10S Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	310	50
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	16	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	5	1

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-3
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 2D   Sample Date: 4/28-29   Time: N/S

VOLATILE/601&602   VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	32	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	4	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	10	1

Pioneer LABORATORY, INC

1 : EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-4
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 7D Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-5
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: WH Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	110	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	5000	100
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	2	1

Pioneer
LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-6
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 6S Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	38	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	3	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

Pioneer
LABORATORY INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-7
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 14A Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

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LABORATORY, INC
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PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-8
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 14S Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	160	50
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	900	100
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	6	1

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Client: GERAGHTY & MILLER
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Lab I.D.#: 88-1524-9
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 14B   Sample Date: 4/28-29   Time: N/S

'OLATILE/601&602   VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	140	50
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	810	10
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	4	1

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Client: GERAGHTY & MILLER
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Lab I.D.#: 88-1524-10
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 13D Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	200	50
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	2100	100
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

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Client: GERAGHTY & MILLER
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Lab I.D.#: 88-1524-11
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 15S Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

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Client: GERAGHTY & MILLER
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Lab I.D.#: 88-1524-12
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 4S Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	91	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	19	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

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Client: GERAGHTY & MILLER
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Lab I.D.#: 88-1524-13
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 5S Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	92	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	6900	100
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	9	1

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Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-14
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 1S Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	140	10
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	30000	1000
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	2	1

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Client: GERAGHTY & MILLER
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Lab I.D.#: 88-1524-15
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 3S Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	50	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	51	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	21	1

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Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-16
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 3B Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	67	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	25	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	23	1

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Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-17
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: TRIP BLANK Sample Date: 4/28-29 Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-18
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 11A Sample Date: 4/28-29 Time: N/S

/OLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

Pioneer LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1524-19
Order Date: 04/30/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: 11S
Sample Date: 4/28-29
Time: N/S

VOLATILE/601&602 VOLATILE 601 & 602

Parameter	Units	Result	Detection Limit
BENZENE	PPB	BDL	1
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHYLENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
ETHYLBENZENE	PPB	BDL	1
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
TOLUENE	PPB	BDL	1
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

end of report

Pioneer
LABORATORY, INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

RECEIVED
JUN 6 1988
Geraghty & Miller, Inc.

Client:	GERAGHTY & MILLER	Lab I.D.#:	88-1904
07039	2700 PGA BLVD	Order Number:	P12982
	SUITE 104	Order Date:	05/31/88
	PALM BEACH GD FL 33410-0000	Sampled By:	D. ALM
		Sample Date:	05/27/88
		Sample Time:	N/S

Project Number: PF1148AD01
Project Name: GERAGHTY AND MILLER
Sample Site: N/S
Sample Type: GROUNDWATER

N/S = Not Submitted

R E S U L T S

reported on the following page(s)

Comments: PPB = Parts Per Billion, ug/l; BDL = Below Detection Limit;
Method Reference: Federal Register 40 CFR Part 136, July 1, 1987.

Approved By : W. F. Bowers

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1904-1
Order Date: 05/31/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: MW-1S Sample Date: 05/27/88 Time: N/S

/OL/601 VOLATILE METHOD 601

Parameter	Units	Result	Detection Limit
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHENE	PPB	300	50
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	25000	100
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	3	1

Pioneer LABORATORY INC
11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

Client: GERAGHTY & MILLER
07039

Lab I.D.#: 88-1904-2
Order Date: 05/31/88
Sampled By: D. ALM

Sample Site: N/S
Sample Type: GROUNDWATER

Sample ID.: TRIP BLANK Sample Date: 05/27/88 Time: N/S

/OL/601 VOLATILE METHOD 601

Parameter	Units	Result	Detection Limit
BROMODICHLOROMETHANE	PPB	BDL	5
BROMOFORM	PPB	BDL	5
BROMOMETHANE	PPB	BDL	5
CARBON TETRACHLORIDE	PPB	BDL	3
CHLOROBENZENE	PPB	BDL	1
CHLOROETHANE	PPB	BDL	5
2-CHLOROETHYLVINYL ETHER	PPB	BDL	5
CHLOROFORM	PPB	BDL	5
CHLOROMETHANE	PPB	BDL	5
DIBROMOCHLOROMETHANE	PPB	BDL	5
1,2-DICHLOROBENZENE	PPB	BDL	5
1,3-DICHLOROBENZENE	PPB	BDL	5
1,4-DICHLOROBENZENE	PPB	BDL	5
DICHLORODIFLUOROMETHANE	PPB	BDL	5
1,1-DICHLOROETHANE	PPB	BDL	5
1,2-DICHLOROETHANE	PPB	BDL	3
1,1-DICHLOROETHENE	PPB	BDL	5
TRANS-1,2-DICHLOROETHENE	PPB	BDL	5
1,2-DICHLOROPROPANE	PPB	BDL	5
CIS-1,3-DICHLOROPROPENE	PPB	BDL	5
TRANS-1,3-DICHLOROPROPENE	PPB	BDL	5
METHYLENE CHLORIDE	PPB	BDL	5
1,1,2,2-TETRACHLOROETHANE	PPB	BDL	5
TETRACHLOROETHENE	PPB	BDL	3
1,1,1-TRICHLOROETHANE	PPB	BDL	5
1,1,2-TRICHLOROETHANE	PPB	BDL	5
TRICHLOROETHENE	PPB	BDL	1
TRICHLOROFLUOROMETHANE	PPB	BDL	5
VINYL CHLORIDE	PPB	BDL	1

end of report

Pioneer LABORATORY, INC.

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
3700 PGA BLVD., SUITE 104
PALM BEACH, FLORIDA 33410

PROJECT: PF1148AD01

Volatile Method: 601 & 602

QC LEVEL I

LAB ID: 88 1524

LAB ID	CLIENT ID	ANALYSIS DATE	BATCH #
88-1524-1	WM	05/03/88	J23
88-1524-2	10S	05/03/88	J23
88-1524-3	2D	05/03/88	J23
88-1524-11	15S	05/04/88	J23
88-1524-12	4S	05/04/88	J23
88-1524-16	3B	05/04/88	J23
88-1524-17	TRIP BLANK	05/04/88	J23
88-1524-18	11A	05/04/88	J23
88-1524-19	11S	05/04/88	J23
SPIKE		05/03/88	J23
SPIKE DUP		05/03/88	J23
DI BLANK		5/03/88 & 5/04/88	J23

DI BLANK - ALL PARAMETERS BDL

REAGENT WATER SPIKE/SPIKE DUPLICATE RECOVERY

PARAMETER	SPIKE RESULT	SPIKE DUPLICATE RESULT	SPIKE EXPECTED VALUE	% REC. SPIKE	% REC. SPIKE DUPLICATE	% REC. CONTROL LIMITS	SPIKE RPD	MAXIMUM RPD
1,1-Dichloroethene	55	52	50	110	104	61-145	6	14
Trichloroethene	47	45	50	94	90	71-120	4	14
Benzene	42	42	50	84	84	76-127	0	11
Toluene	47	49	50	94	98	76-125	4	13
Chlorobenzene	57	61	50	114	122	75-130	7	13

ALL QC DATA FOR THIS BATCH ARE WITHIN ACCEPTABLE LIMITS.

Note: ppb = parts per billion, ug/l
BDL = below detection limits
Results reported are blank corrected.
Source for control limits is internal laboratory quality assurance program and the Federal Register (see below).

Reference: Federal Register, 40 CFR, Part 136, July 1, 1987.

Pioneer
LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

GERAGHTY & MILLER, INC.
2700 PGA BLVD., SUITE 104
PALM BEACH, FLORIDA 33410

PROJECT: PF1148AD01

Volatile Method: 601 & 602

QC LEVEL I

LAB ID: 88-1524

LAB ID	CLIENT ID	ANALYSIS DATE	BATCH #
88-1524-4	7D	05/03/88	L18
88-1524-5	WH	05/03/88	L18
88-1524-6	6S	05/03/88	L18
88-1524-7	14A	05/03/88	L18
88-1524-8	14S	05/03/88	L18
88-1524-9	14B	05/03/88	L18
88-1524-10	13D	05/03/88	L18
88-1524-13	5S	05/04/88	L18
88-1524-14	1S	05/04/88	L18
88-1524-15	3S	05/04/88	L18
SPIKE		05/03/88	L18
SPIKE DUP		05/03/88	L18
DI BLANK		5/03/88 & 5/04/88	L18

DI BLANK - ALL PARAMETERS BDL

REAGENT WATER SPIKE/SPIKE DUPLICATE RECOVERY

PARAMETER	SPIKE RESULT	SPIKE DUPLICATE RESULT	SPIKE EXPECTED VALUE	% REC. SPIKE	% REC. SPIKE DUPLICATE	% REC. CONTROL LIMITS	SPIKE RPD	MAXIMUM RPD
1,1-Dichloroethene	45	48	50	90	96	61-145	6	14
Trichloroethene	52	56	50	104	112	71-120	7	14
Benzene	49	53	50	98	106	76-127	8	11
Toluene	60	60	50	120	120	76-125	0	13
Chlorobenzene	60	63	50	120	126	75-130	5	13

ALL QC DATA FOR THIS BATCH ARE WITHIN ACCEPTABLE LIMITS.

Note: ppb = parts per billion, ug/l
BDL = below detection limits
Results reported are blank corrected.
Source for control limits is internal laboratory quality assurance program and the Federal Register (see below).

Reference: Federal Register, 40 CFR, Part 136, July 1, 1987.

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

[illegible] & MILLER, INC.
[illegible] PALM BEACH [illegible], SUITE [illegible]
[illegible]

PROJECT: PF1148AD01

QC LEVEL [illegible]

[illegible] ID 88 1004

LAB ID	CLIENT ID	ANALYSIS DATE	BATCH #
[illegible] 1004 1	[illegible]	[illegible]	[illegible]
88 1004 2	TRIP BLANK	5/01/88	[illegible]
SPIKE		[illegible]	[illegible]
SPIKE DUP		[illegible]	[illegible]
QC BLANK		[illegible]	[illegible]

[illegible] BLANK ALL PARAMETERS [illegible]

REAGENT WATER SPIKE/SPIKE DUPLICATE RECOVERY

PARAMETER	SPIKE RESULT	SPIKE DUPLICATE RESULT	SPIKE EXPECTED VALUE	% REC. SPIKE	% REC. SPIKE DUPLICATE	% REC. LIMITS	SPIKE RPD	MAXIMUM RPD
1,1-Dichloroethene	55	[illegible]	60	[illegible]	[illegible]	[illegible]	8	14
Trichloroethene	[illegible]	62	60	[illegible]	103	71-120	11	14
Benzene	54	[illegible]	60	90	[illegible]	[illegible]	[illegible]	[illegible]
Toluene	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	75-125	[illegible]	[illegible]
Chlorobenzene	[illegible]	[illegible]	60	[illegible]	[illegible]	75-[illegible]	[illegible]	13

ALL QUALITY CONTROL DATA FOR THIS BATCH IS WITHIN ACCEPTABLE LIMITS.

Note: ppb = parts per billion, ug/l
BDL = below detection limit
Results [illegible]
[illegible] control limits [illegible] internal laboratory quality assurance program
and the Federal Register [illegible].

Reference: Federal Register [illegible] CFR Part 136, [illegible] 1987

ORLANDO LABORATORIES INC.

P.O. Box 19127 • Orlando, Florida 32814 • (407) 896-6645

REPORT OF ANALYSIS

Geraghty & Miller, Inc.
2700 PGA Blvd. Suite 104
Palm Beach Gardens, Florida 33410

Report #:	1260(5518)
Sampled submitted by:	Client*
Date sampled:	04-28-88
Date received:	05-02-88
Date reported:	05-04-88
	Page 1 of 2

PURPOSE: To analyze the sample for 601 determinations.
AUTHORIZATION: Sample Identification Form received from client on 05-02-88.
SAMPLE IDENTIFICATION: Sample submitted and identified by Client as: 14C
PROCEDURE: EPA METHOD 601

RESULTS:

DETERMINATION:	UNITS:	RESULTS
EPA 601-PURGEABLE ORGANICS - HALOCARBONS		
Bromodichloromethane	mg/l	ND(0.001)
Bromoform	mg/l	ND(0.001)
Bromomethane	mg/l	ND(0.001)
Carbon Tetrachloride	mg/l	ND(0.001)
Chloroethane	mg/l	ND(0.001)
2-Cloroethylvinyl Ether	mg/l	ND(0.001)
Chloroform	mg/l	ND(0.001)
Chloromethane	mg/l	ND(0.001)
Dibromochloromethane	mg/l	ND(0.001)
1,1,2-Trichloroethane	mg/l	ND(0.001)
1,2-Dibromo-3-Chloropropane	mg/l	ND(0.001)
Dichlorodifluoromethane	mg/l	ND(0.001)
1,1-Dichloroethane	mg/l	ND(0.001)
1,2-Dichloroethane	mg/l	ND(0.001)
1,1-Dichloroethene	mg/l	ND(0.001)
cis-1,2-Dichloroethene	mg/l	ND(0.001)
trans-1,2-Dichloroethene	mg/l	0.19
1,2-Dichloropropane	mg/l	ND(0.001)
cis-1,3-Dichloropropene	mg/l	ND(0.001)
trans-1,3-Dichloropropene	mg/l	ND(0.001)
Methylene Chloride	mg/l	ND(0.001)
1,1,2,2-Tetrachloroethane	mg/l	ND(0.001)
Tetrachloroethene	mg/l	ND(0.001)
1,1,1-Trichloroethane	mg/l	0.006
Trichloroethene	mg/l	0.14
Trichlorofluoromethane	mg/l	ND(0.001)
Vinyl Chloride	mg/l	ND(0.001)

ND = Not detected to the level in parentheisis.
*Sampling information based on data supplied by client.

Geraghty & Miller, Inc.

Report #: 1260(5518)

QUALITY CONTROL DATA SHEET

DUPLICATES:

PARAMETER	% DIFFERENCE	DATE	ANALYST
Trichlorofluoromethane	1	05-02-88	D.M.
1,1-Dichloroethane	6	05-02-88	D.M.
t-1,2-Dichloroethene	3	05-02-88	D.M.
Toluene	3	05-02-88	D.M.
Chlorobenzene	3	05-02-88	D.M.
Ethylbenzene	3	05-02-88	D.M.

SPIKES:

PARAMETER	% RECOVERY	DATE	ANALYST
Trichlorofluoromethane	96/95	05-02-88	D.M.
1,1-Dichloroethane	99/105	05-02-88	D.M.
t-1,2-Dichloroethene	98/95	05-02-88	D.M.
Toluene	109/106	05-02-88	D.M.
Chlorobenzene	98/101	05-02-88	D.M.
Ethylbenzene	106/109	05-02-88	D.M.

Respectfully submitted,
ORLANDO LABORATORIES, INC.

Martin A. Zenas

Laboratory Manager

Wonetta Lassiter Satterfield

Quality Control

PLATES

[redacted]

Reference 11

Conversation Record

3:45 PM
11/30/88

Corporate Records
Dept. of State - Florida

~~owner~~ Pres: Wilbur H..... Gantz VP R.J. Lambrix
incorporated in Fla: 4/10/67

STATE OF FLORIDA

STATE BOARD OF CONSERVATION

Ernest Mitts, Director

FLORIDA GEOLOGICAL SURVEY

Herman Gunter, Director

REPORT OF INVESTIGATIONS NO. 17

BISCAYNE AQUIFER OF DADE AND BROWARD COUNTIES, FLORIDA

By

Melvin C. Schroeder, Howard Klein, and Nevin D. Hoy

U. S. Geological Survey

Prepared by the

UNITED STATES GEOLOGICAL SURVEY

in cooperation with the

FLORIDA GEOLOGICAL SURVEY

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT

DADE COUNTY

CITIES OF MIAMI, MIAMI BEACH and FORT LAUDERDALE

TALLAHASSEE, FLORIDA

1958

BISCAYNE AQUIFER OF DADE AND BROWARD COUNTIES, FLORIDA

ABSTRACT

The Biscayne aquifer is the only source of fresh ground water in Dade and Broward counties, Florida. Composed of highly permeable limestone and sand mainly of Pleistocene age, the aquifer supplies large quantities of water, of excellent quality except for hardness, for municipal, industrial, and irrigational use. The aquifer attains its maximum thickness in the Atlantic coastal areas and wedges out in western Dade and Broward counties.

Water-table conditions prevail in the Biscayne aquifer, and the water table fluctuates with variations in rainfall, evapotranspiration, and pumping. High ground-water levels occur during the fall months and low levels during spring and early summer. The highest water levels of record occurred in October 1947, when intense rainfall accompanying a hurricane flooded large areas throughout the two counties. Major discharge from the aquifer occurs by natural outflow and evapotranspiration. The average daily pumpage from the Biscayne aquifer in 1950 is estimated to have been 130 million gallons.

Permeability tests show that the limestones of the Biscayne aquifer rank among the most productive aquifers ever investigated by the U. S. Geological Survey.

Salt-water encroachment in the aquifer has taken place in coastal areas of southeastern Florida. The greatest inland advance of salt-water intrusion has occurred as tongues along tidal drainage canals and rivers.

INTRODUCTION

LOCATION AND GEOGRAPHY OF AREA

Dade and Broward counties are in southeastern Florida, bordering the Atlantic Ocean (fig. 1). The Atlantic Coastal Ridge, whose average elevation is between 8 and 10 feet above mean sea level, occupies the eastern portion of the area from the coast to a few miles inland. Maximum elevations at isolated highs range from 20 to 25 feet above sea

PERSONNEL AND ACKNOWLEDGMENTS

The data presented in this report cover the results of studies made by the U. S. Geological Survey in cooperation with the Florida Geological Survey, Dade County, the cities of Miami, Miami Beach, Coral Gables, and Fort Lauderdale, and the Central and Southern Florida Flood Control District. The continued interest and help of the officials of these agencies have made it possible to develop the necessary program to study the aquifer and the fluctuations of the ground-water levels.

The investigation was made under the general supervision of A. N. Sayre, Chief, Ground Water Branch, U. S. Geological Survey. V. T. Stringfield and Garald G. Parker of the U. S. Geological Survey gave valuable advice. The Corps of Engineers, U. S. Army, cooperated by permitting examination of the cores and records of a great number of core borings.

BISCAYNE AQUIFER

DEFINITION

Meinzer (1923, p. 52, 53) has defined an aquifer as a rock formation or stratum that will yield water in sufficient quantity to be of consequence as a source of supply. A formation yielding meager amounts of water might not be considered to be an aquifer in an area where there are other formations that yield prolifically but might be considered to be one in an area where little water is available.

Wherever possible, an aquifer is identified by the name or names of the stratigraphic units composing it. Where an aquifer crosses stratigraphic lines, or where its stratigraphy is uncertain, yet it is well known to constitute a hydrologic unit, an aquifer may be given a proper name. The principal aquifer in this area is such a unit.

The name Biscayne aquifer was proposed by Parker (1951, p. 820-823) for the hydrologic unit of water-bearing rocks that carries unconfined ground water in southeastern Florida. The aquifer is a single hydrologic unit of permeable materials ranging in age from late Miocene through Pleistocene. The boundaries of the aquifer, both horizontal and vertical, are set not by formational contacts or age restrictions but by differences in the hydrologic properties of the sediments. The lowermost component of the Biscayne aquifer is a limestone or shelly calcareous sandstone of the upper part of the Tamiami formation in the northeastern part of Dade County and the southeastern part of Broward County. The remaining and major portion of the Biscayne aquifer is composed of rocks ranging in age from Pliocene through Pleistocene in the following

sequence from bottom to top: Caloosahatchee marl (as erosion remnants), Fort Thompson formation, Key Largo limestone, Anastasia formation, Miami oolite, and Pamlico sand. The aquifer is underlain by a relatively impermeable greenish marl of the Tamiami formation. The contact between the marl and the limestone of the Tamiami, Fort Thompson, or Anastasia formations, or the Key Largo limestone, forms the lower boundary of the aquifer.

In the Miami area the base of the Biscayne aquifer is easily determined by the occurrence of the impervious marl of the Tamiami formation. However, it is more difficult to define the basal or lateral limits in Broward County where clastic sediments rather than limestones constitute a major part of the Pleistocene sequence. The interfingering and the vertical and horizontal gradation of sands and calcareous materials present a problem similar to determining the demarcation between two different lithologic facies of the same geologic time unit. In an aquifer the ground water should be free to move in any direction, under the proper hydraulic gradient. In northwesternmost Broward County (fig. 1) the water in sands whose elevation and stratigraphic position are similar to those in the Biscayne aquifer to the southeast apparently does not move freely, as shown by its high mineralization. These sands, therefore, are not considered a part of the Biscayne aquifer.

AREAL EXTENT AND THICKNESS

The Biscayne aquifer underlies all the coastal areas and most of the Everglades to and a little beyond the Broward-Palm Beach county line (fig. 1).

The thickness of the aquifer is greatest along the coast in the Miami area and northward in the vicinity of Fort Lauderdale, where it is 200 feet in places. The aquifer decreases in thickness gradually southward from Miami, and rapidly westward into the Everglades; beyond its thickest portion in the Everglades it thins out to a featheredge in eastern Collier and Monroe counties.

Figure 2 shows contours on the base of the highly permeable rock in Dade and Broward counties. The base of the Biscayne aquifer is commonly drawn at the base of the formations of Pleistocene age except for the coastal area in Broward County and in northeastern Dade County, where the boundary occurs within the Tamiami formation, and other isolated areas where the base is placed at the bottom of limestone

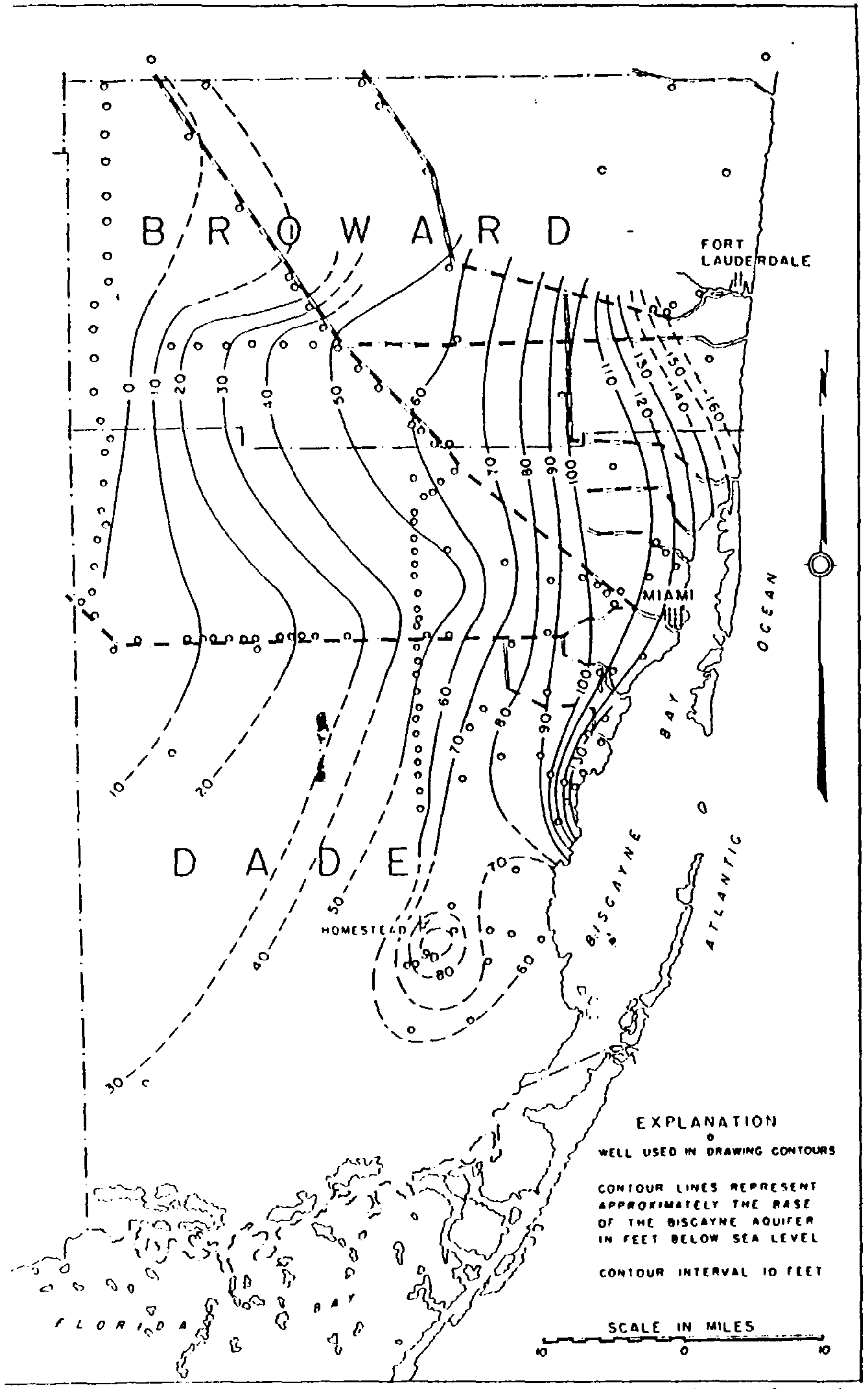


Figure 2. Structure contour map of Dade and Broward counties showing base of Biscayne aquifer.

that perhaps is the Caloosahatchee marl. Subsurface geologic data in southern Dade County are scanty because very few core holes have been drilled.

The areal extent of the Biscayne aquifer as shown in figure 1 is based upon the available data, and collection of additional information concerning the geology and the hydrologic characteristics may either increase or decrease the areal extent shown.

GEOLOGIC FORMATIONS COMPOSING THE BISCAYNE AQUIFER

GENERAL FEATURES

The Biscayne aquifer includes the following stratigraphic units: the upper part of the Tamiami formation in the coastal areas of Broward County and northeastern Dade County; the small erosional remnants of the Caloosahatchee marl in southern Broward County; the Anastasia formation in Broward County and southern Palm Beach County; the Fort Thompson formation in Dade and Broward counties, except the western part of Dade County north of the Tamiami Trail and northwest Broward County where the formation is relatively impermeable; the Key Largo limestone in Dade and Monroe counties; and the Miami oolite and the Pamlico sand in Broward and Dade counties. The Lake Flirt marl and more recent deposits, including the organic soils of the Everglades and marine marls bordering the coast, are excluded from the Biscayne aquifer.

The generalized surface distribution of the various geologic formations is shown on figure 3. The map is based upon recent observations of both surface exposures and well cuttings and is adapted and revised from geologic maps of Florida by Cooke (1945, pl. 1) and R. O. Vernon (in Black and Brown, 1951, p. 7) and of southern Florida by Parker and Cooke (1944, pl. 15). The field notes of Mr. Parker have been used extensively for descriptions of exposures and borrow pits no longer in existence.

The formations appearing on the geologic map and mentioned in the report are as follows:

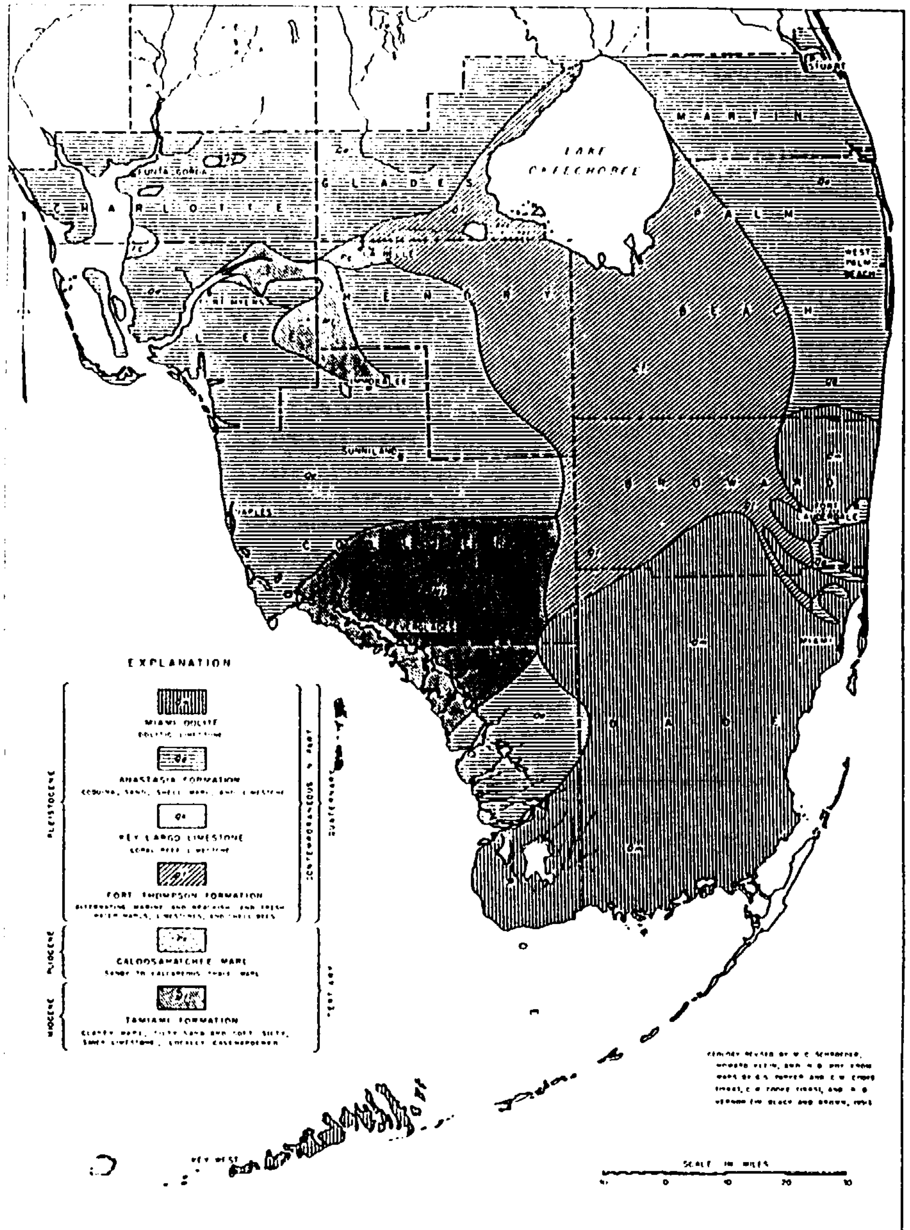


Figure 3. Geologic map of southern Florida.

LATE CENOZOIC FORMATIONS OF DADE AND BROWARD COUNTIES

Age	*Formation*	*Characteristics*	*Thickness (feet)*
Recent and Pleistocene	Soils	Peat and muck; laterite.	0-12
	Lake Flirt marl	White to gray calcareous mud, rich with shells of *Helisoma* sp., a fresh-water gastropod. In some places casehardened to a dense limestone. Relatively impermeable.	0-6
Pleistocene (Formations are contemporaneous in part)	Pamlico sand	Quartz sand, white to black or red, depending upon nature of staining materials, very fine to coarse, average medium. Mantles large areas underlain by Miami oolite and Anastasia formation.	0-40
	Miami oolite	Limestone, oolitic, soft, white to yellowish, containing streaks or thin layers of calcite, massive to crossbedded and stratified; generally perforated with vertical solution holes. Fair to good aquifer.	0-40
	Anastasia formation	Coquina, sand, calcareous sandstone, sandy limestone, and shell marl. Probably composed of deposits equivalent in age to marine members of Fort Thompson formation. Fair to good aquifer.	0-120
	Key Largo limestone	Coralline reef rock, ranging from hard and dense to soft and cavernous. Probably interfingers with the marine members of the Fort Thompson formation. Crops out along southeastern coast line of Florida from Soldier Key in Biscayne Bay to Bahia Honda. Excellent aquifer.	0-60
	Fort Thompson formation	Alternating marine, brackish-water and fresh-water marls, limestones, and sandstone. A major component of the highly permeable Biscayne aquifer of coastal Dade and Broward counties, which yields copious supplies of ground water.	0-150
Pliocene	Caloosahatchee marl	Sandy marl, clay, silt, sand, and shell beds. Yields ground water less abundantly than most other parts of the Biscayne aquifer.	0-25
Miocene	Tamiami formation	Cream, white, and greenish-gray clayey marl, silty and shelly sands, and shell marl, locally hardened to limestone. Upper part, where permeability is high, forms the lower part of the Biscayne aquifer. Lower and major part of formation is of low permeability and forms the upper beds of the aquiclude that confines water in the Floridan aquifer (Ocala and associated limestones) below.	0-100

MIOCENE SERIES

TAMIAMI FORMATION

The Tamiami formation as redefined by Parker (1951, p. 823) includes all the upper Miocene materials in southern Florida, including the Tamiami limestone of Mansfield (1939, p. 8). Excluded from the formation is the "Tamiami" formation of Parker and Cooke (1944, p. 62-65) in Dade County. Parker and Cooke correlated the limestone that Mansfield found cropping out along the Tamiami Trail in Collier and Monroe counties with the highly permeable limestones and sandstones which unconformably underlie the Miami oolite of Pleistocene age in the eastern Everglades and Miami area. Their correlation was based on cuttings from percussion-type or cable-tool drilled wells, which penetrated the aquifer, but the comminuted condition of the cuttings prevented identification of any fresh-water limestones intercalated with marine limestones. Subsequent exploratory core drillings in the Everglades and Miami area by the Corps of Engineers, U. S. Army, and the U. S. Geological Survey revealed the occurrence of fresh-water gastropods in limestone beds underlying the Miami oolite to a depth of 55 feet below sea level. Because the oldest known fresh-water limestones in this region are of Pleistocene age, most of the material underlying the eastern Everglades and the Miami area has been tentatively referred to the Pleistocene, by Parker (1951, p. 822, 823), and Hoy and Schroeder (1952, p. 283-285).

The Tamiami formation is divisible lithologically and hydrologically into two units: a relatively impermeable clastic unit, and a permeable limestone and sandstone unit. The two units have no stratigraphic significance, although in many places the clastics form the base and sandstones or limestones the uppermost part of the formation. However, the units are primarily geographic. Limestone is commonly exposed at the surface in the outcrop of the Tamiami formation in the Big Cypress Swamp and the Sunniland area; permeable sandstone composes the upper part of the formation in the subsurface of the coastal area of Broward County and northeastern Dade County. The subsurface Tamiami formation near Carnestown, Sunniland, and Immokalee in Collier County is a creamy-white, clayey, shelly marl, which in part has been indurated to a permeable limestone as a result of water-table fluctuation and ground-water percolation. Toward the east the formation increases in sand and marl content, and in Dade and Broward counties most of the formation consists of relatively impermeable clastics composing the upper part of the aquiclude that confines water in the Floridan aquifer, the principal artesian aquifer of the Florida Peninsula and adjacent area.

PLIOCENE SERIES

CALOOSAHATCHEE MARL

The Caloosahatchee marl is the only Pliocene material found in southern Florida. It was named by Matson and Clapp (1909, p. 123) for the soft, semiconsolidated sediments that form low bluffs along the Caloosahatchee River between La Belle and Denaud in Hendry County.

The Caloosahatchee marl is commonly a light greenish-gray silty, shelly marl, with varying amounts of sand. Sand and shells, occurring both in beds and in lenses, locally form a shell marl. Ground-water movement and exposure to air have locally casehardened and cemented the more sandy and shelly material to a calcareous rock which subsequently has been made permeable by solution of limestone and washing out of clastic material. Generally the formation is relatively impermeable, except locally where very shelly layers or lenses predominate.

The Caloosahatchee marl is known to extend 25 miles southward from Lake Okeechobee where it underlies Pleistocene rocks in the form of thin permeable limestone and sandstone reefs or "shoestring" sands. Present data are not yet sufficient to determine the extent of Pliocene deposits beneath the lower Everglades, but faunal evidence from a well near Kendall suggests the possibility of the occurrence in Dade County of isolated remnants of the Caloosahatchee marl.

It was previously thought by Parker and Cooke (1944, p. 59) that, south of Lake Okeechobee between the Dade-Broward county line and the approximate latitude of Twenty-Six Mile Bend of the North New River Canal, the Caloosahatchee and Tamiami formations were possibly contemporaneous and interfingered in the subsurface. However, more recent exploratory drilling has indicated that this material to about 60 feet below sea level is probably of Pleistocene age. This would mean that the Caloosahatchee marl, which is 30 to 50 feet thick near Lake Okeechobee, thins to 6 feet at a place a mile south of the Broward-Palm Beach county line and the North New River Canal. The marl has not been definitely recognized in well cuttings south of that place in Broward or Dade counties.

PLEISTOCENE SERIES

FORT THOMPSON FORMATION

The Fort Thompson formation is the name applied to the alternating fresh-water and marine limestones and marl beds which unconformably overlie the Caloosahatchee marl at old Fort Thompson 1¾ miles east of La Belle. Originally referred to as the Fort Thompson beds by Sellards

(1919, p. 71, 72), the unit was later named the Fort Thompson formation by Cooke and Mossom (1929, p. 211-215), and was defined to include the overlying marine Coffee Mill Hammock marl. In the lower Everglades the Fort Thompson formation overlies the Tamiami formation, or, where present, erosional remnants of the Caloosahatchee marl, and underlies the Miami oolite unconformably. In the northern part of the area the *Fort Thompson is overlain by the younger portion of the* Anastasia formation, the Lake Flirt marl, or the Pamlico sand.

The Fort Thompson formation at the type locality is a succession of shelly marine and nonmarine limestones and marls, including three distinct marine beds. The uppermost, the Coffee Mill Hammock member, is a shell marl, consisting chiefly of shells of *Chione cancellata.* The marine marl members are separated by gray, shelly, marl beds, in part indurated to limestone, containing the fresh-water gastropods *Helisoma* and *Ameria.* The fresh-water beds are pierced by vertical and lateral solution cavities formed by ground-water percolations. Subsequent filling of the cavities by marine marls has produced a network of interconnected and isolated marine and fresh-water marls and limestones. In places, holes penetrate the entire thickness of the formation so that the Coffee Mill Hammock member lies directly upon the Caloosahatchee marl of Pliocene age as a solution-hole filling. The alternation of marine and fresh-water beds indicates, according to Parker and Cooke (1944, p. 94-96, fig. 4), onlapping and offlapping seas from the end of Pliocene time through the Sangamon interglacial stage of the Pleistocene.

Core borings of the thick section of permeable limestone and sandstone in the lower Everglades, between the Miami oolite and the Tamiami formation, similarly show interbeds and cavity fillings of fresh-water limestone with marine limestone (figs. 4-9). This interbedded material forms the major part of the Biscayne aquifer and, as previously mentioned, has been tentatively correlated by Hoy and Schroeder (1952, p. 283-286) with the Fort Thompson formation.

The Fort Thompson formation in the Dade-Broward county area is predominantly light gray to cream, fossiliferous, marine, sandy limestone and calcareous sandstone, with a few thin beds of gray and tan fresh-water limestone. The entire section has been subjected to solution by ground water, and the result is a cavity-riddled mass of permeable rock. Solution cavities are as much as several feet in diameter; some are filled or partially filled with fine and medium quartz sand. Some sand filling possibly occurred during flooding by Pleistocene seas. Loose sand such as this decreases the permeability of the aquifer, but if wells are heavily pumped much of the sand will be removed and a high permeability adjacent to a well will result.

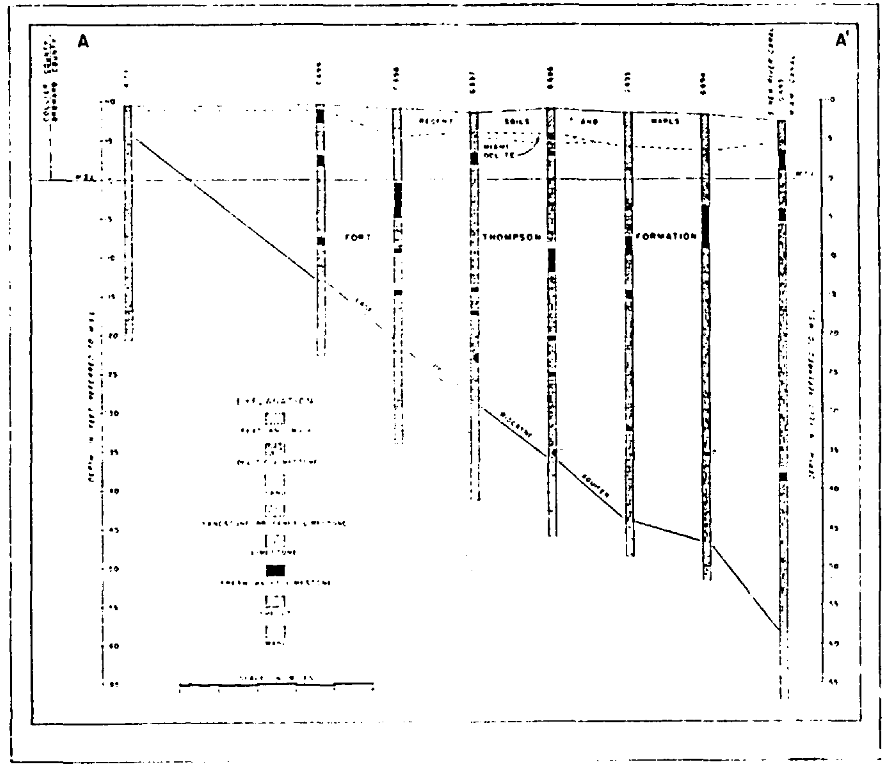


Figure 4. West-east geologic cross section in western Broward County.

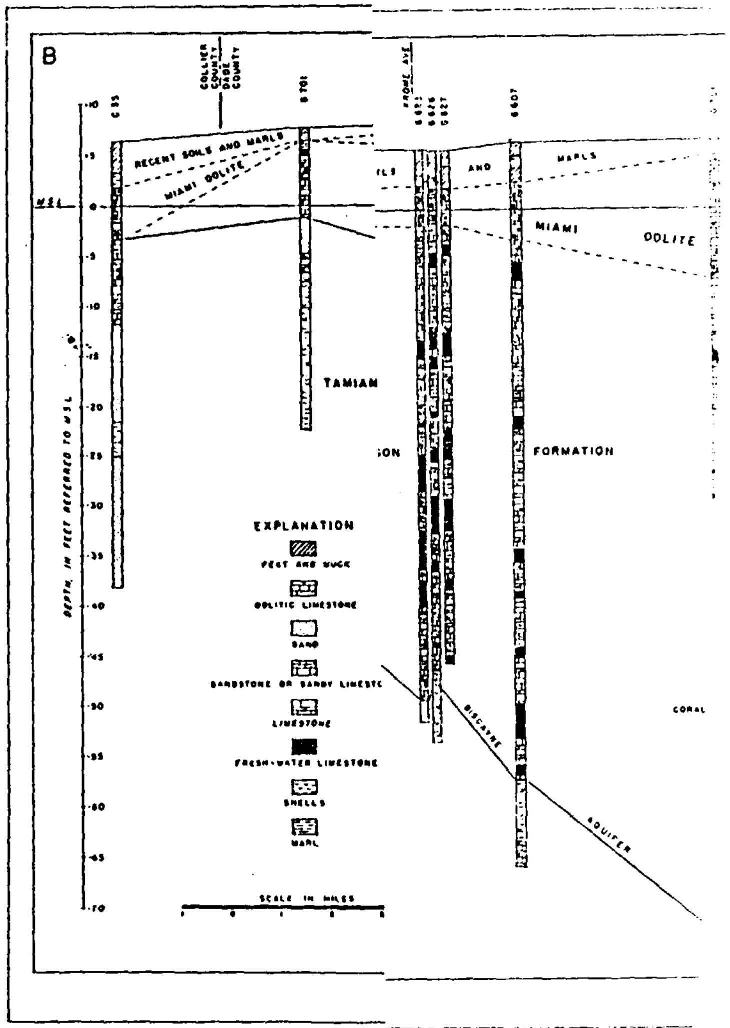
Cementation and redeposition of materials by ground-water movement are very much in evidence throughout the Fort Thompson formation. Cementation of sand bodies by calcium carbonate has produced layers of hard, dense sandstone. Locally the cement is siliceous, producing a very hard quartzitic sandstone. An examination of limestone cores frequently shows secondary deposits of calcite crystals inside cavities or within concavities of marine shells. Fossils are preserved chiefly as molds and casts, rarely in their original form. Some cores of the Fort Thompson formation show indications of bedding planes which provide zones of weakness along which ground-water solution takes place. Part of the Fort Thompson formation is composed of very dense, hard nonfossiliferous limestone exhibiting little or no effect of ground-water action. In general, highly fossiliferous beds are markedly pitted with solution holes.

Because no unconformable relationship has been noted between the Fort Thompson and older formations, the contact is normally placed beneath the lowest sandy marine limestone which underlies fresh-water beds. It is recognized that a part of this basal material in some places may include formations of either Pliocene or late Miocene age.

The contact between the Fort Thompson formation and the Miami oolite, as observed in spoil banks along canals in the Everglades, is unconformable and is usually placed at the maximum depth at which oolites appear. The upper surface of the Fort Thompson is uneven and is characterized by solution pits and depressions and vertical solution holes. Oolitic material admixed with loose, sandy detritus from the Fort Thompson was deposited on this eroded surface and filled depressions to depths a few feet below the actual contact. These cavity fillings are easily discerned in core samples because the filling material is heterogeneous and shows a color contrast. A layer of very hard, dense, cream to gray, sandy limestone, which is peculiarly mottled or banded with brown and tan limestone, occurs in the Fort Thompson below the contact. In places the material appears to be a conglomerate containing weathered pebbles of the Fort Thompson formation, but in at least some of these places the "conglomerate" is the result of irregular deposition of iron oxide in interstices of the Fort Thompson, along with differential cementation of those areas. The banding may denote an old eroded surface or may be the result of water-table fluctuations.

The occurrence of fresh-water limestones in a great number of core borings that penetrate the aquifer west of the coastal ridge has been plotted in cross sections (figs. 4-6), the locations being shown on figure 7. In addition, a series of shallower borings, 25 to 30 feet below mean sea level, along U. S. Highway 27 (Miami Canal northward to North New River Canal) across Broward County between the Dade and Palm Beach county lines, were examined. Fresh-water limestones are present at shallow depth along U. S. Highway 27 where it adjoins the South New River Canal north to the Palm Beach county line. In another series of holes bored to a depth of about 20 to 25 feet below mean sea level and extending from the North New River Canal to the Hillsboro Canal, along a line approximately 8 miles west of Florida Highway 7, no fresh-water material was noted in the cores. Obviously, it is difficult to determine exactly where the Fort Thompson and Anastasia formations merge, but they seem to merge near the eastern edge of the Everglades.

A similar situation exists in Dade County where fresh-water limestones are not known to occur in coastal areas. Along the western edge of the coastal ridge, a few beds of fresh-water limestone are present, as well as some indications of reef corals. The fresh-water limestones, ranging in thickness from 1 to 3 feet, were noted in the following wells (fig. 7) which are not included in the cross sections:



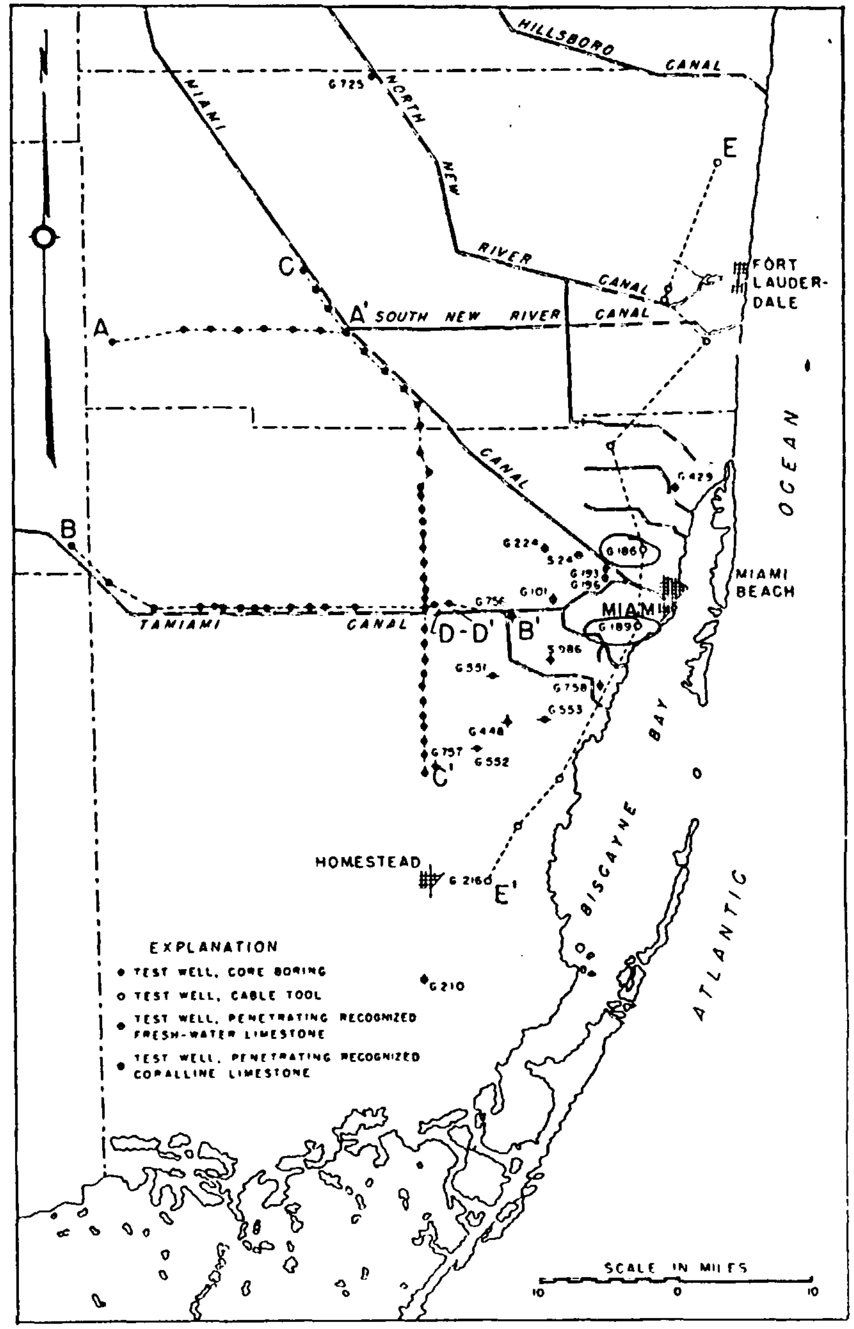


Figure 7. Map of Broward and Dade counties showing location of geologic cross sections and certain test wells.

Well No.	Depth to top of fresh-water limestone, in feet below msl
G 448	41
G 551	37 and 50
G 553	42
G 552	10
S 24	40 to 45 (depth uncertain)
S 986	39

Reference to the section on the Anastasia formation, and to figure 7 showing wells that have penetrated coralline rocks, makes it evident that the Fort Thompson, Key Largo, and Anastasia formations interfinger. Pleistocene marine limestones in certain areas of coastal Dade County cannot be definitely assigned to one of the three formations, because of their transitional character. In some instances the limestone has been arbitrarily placed in the Fort Thompson formation, although it does not contain fresh-water beds, but in others the limestone is placed in the Key Largo, although it is not coralline.

Figures 4 and 5 show west-east geologic sections across the lower Everglades, and figure 6 shows a north-south section at the longitude of Krome Avenue. Figure 8 shows a short west-east section along the Tamiami Trail east of Krome Avenue, where wells were closely spaced, and a possible correlation of fresh-water limestones. Several zones of fresh-water limestone are apparent between wells G 670 and G 624, shown in figure 6, where the uppermost zone occurs between the base of the Miami oolite and a position 8 feet below mean sea level. The most persistent zone and one that definitely appears to be a single layer occurs between 8 and 15 feet below mean sea level and extends southward from well G 670 to well G 653, and possibly farther. The thickness of the fresh-water limestone of this zone ranges from 1 to nearly 5 feet, although the greater thickness may be due to filling of solution holes. This fresh-water limestone is not found at comparable depths in wells G 657 and G 656. Possibly the core pierced a marine cavity fill within the fresh-water limestone, or the bed has been eroded and subsequently covered by younger marine limestone. However, limestone beds plotted a few feet below the minus 15-foot mean-sea-level horizon in these 2 wells may indicate that this bed was deposited in a locally depressed area or a wide solution hole.

A second fresh-water limestone occurs approximately 20 to 30 feet below sea level. This zone extends between wells G 661 and G 653, and wells G 669, G 667, and G 664 farther north containing fresh-water

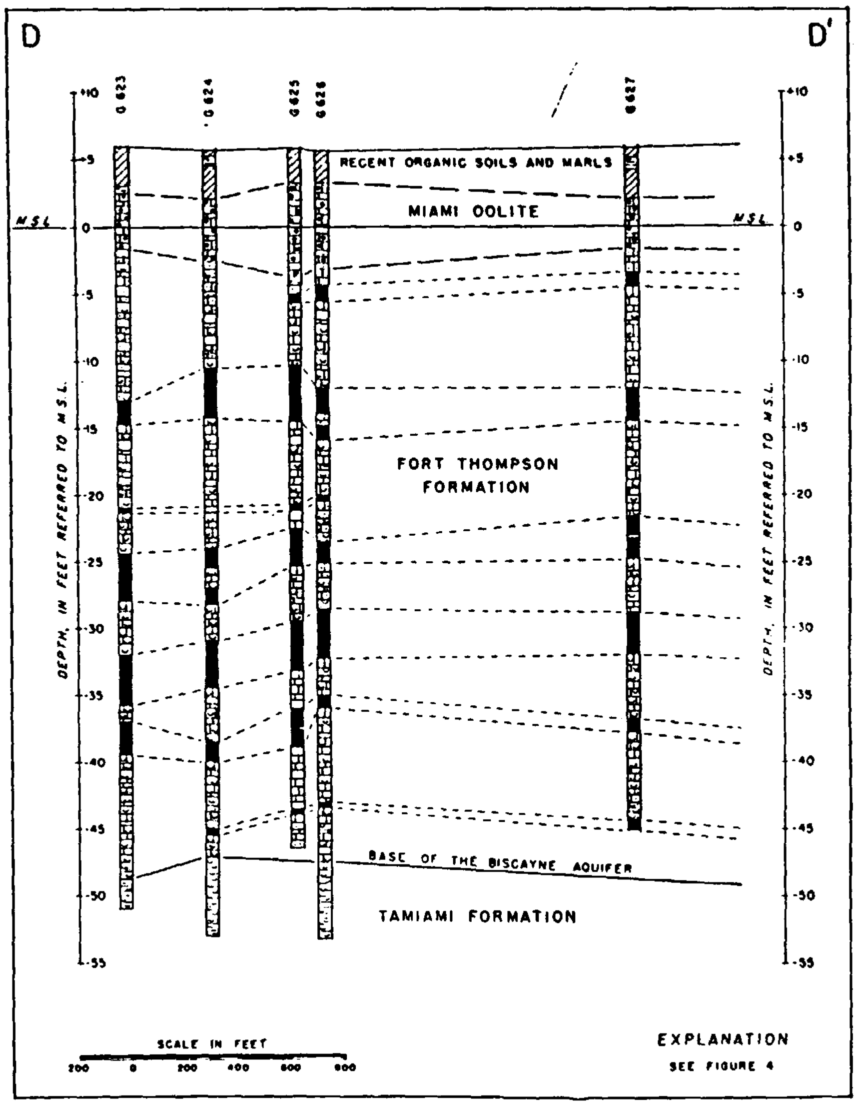


Figure 8. West-east geologic cross section near Krome Avenue at Tamiami Trail.

limestones, at slightly lower elevations, which are probably a continuation of this zone. A similar situation may be true of the wells south of G 653, although these limestones are generally at slightly higher elevations.

Cores from wells G 667, G 664, G 624, and G 757 indicate that 2 or possibly 3 zones of fresh-water limestone may be present between the second zone and the base of the Fort Thompson formation, but definite correlation between wells cannot be made with the information available.

In well G 667 the highest fresh-water limestone is associated with oolitic material and may be part of the Miami oolite. North of the Dade-Broward county line the distribution of fresh-water material was such that it could not be correlated with the more uniformly bedded strata to the south.

Figure 8 shows a locality east of Krome Avenue along the Tamiami Trail, where some of the closely spaced core borings penetrate the entire thickness of the highly permeable aquifer. This section again shows a possible correlation of 6 fresh-water limestone zones similar to that shown in figures 5 and 6. Well G 607 (fig. 5) penetrated 6 beds of fresh-water limestone and a well 42 feet east pentrated the same 6 beds.

At least four limestone beds of fresh-water origin occur within the Pleistocene section at the Palm Beach-Broward county line and the North New River Canal (fig. 7), as shown by the following log of well G 725:

Description	*Depth, in feet, with reference to msl*
Peat and muck, dark brown	+ 10.9 to + 6.1
Clay, mucky, black	+ 6.1 to + 4.8
Limestone, fresh-water, brown, dense, shelly	+ 4.8 to + 4.7
Marl, sandy, marine, in places indurated to sandstone	+ 4.7 to + 1.7
Limestone, fresh-water, dense, brown	+ 1.7 to + 1.1
Sandstone, calcareous, fossiliferous, marine	+ 1.1 to 0.0
Limestone, fresh-water, cream	0.0 to — 1.0
Sandstone, shelly, marine, calcareous	— 1.0 to — 6.0
Limestone, cream, shelly, probably fresh-water (?)	— 6.0 to — 6.5
Marl, very sandy, shelly, tan, marine, with a few fresh-water shells	— 6.5 to — 8.6
Marl, fresh-water, sandy, shelly	— 8.6 to — 10.7
Marl, fresh-water, partially shelly, indurated to limestone	— 10.7 to — 11.5
Sand, marly, tan, very shelly, fresh-water gastropods from — 11.5 to — 12.0, apparently as cavings, containing some marine shells (*Chione cancellata*)	— 11.5 to — 13.5
Sandstone, cream to tan, very shelly, mixed marine and fresh-water at bottom	— 13.5 to — 16.5

A glance at the geologic sections indicates that each fresh-water bed was probably deposited on an undulating and solution-pitted marine limestone. The beds range in thickness from 0.2 foot to nearly 5 feet. Their upper surfaces were probably eroded to some extent by shallow encroaching seas which removed less resistant materials. It is recognized that a few of the fresh-water limestones as plotted are cavity fillings which were deposited in what is definitely marine material. Fresh-water materials could easily have been washed in and deposited in subsurface cavities as well as at the surface.

It is possible that, during major portions of the Pleistocene glacial stages, the lower Everglades was a low-lying marginal area bounded on the west by slightly higher land and on the east by the coastal ridge composed of reef materials. Because of the marginal character of the area, slight rises in sea level would bring about marine floods during which thin marine limestones were deposited. However, with a fall in sea level, the land emerged so that the resulting weathering and eroding of the marine limestones accompanied the deposition of some thin fresh-water limestone. A major advance of the continental ice sheet would cause an extended lowering of sea level, thus allowing a greater thickness of fresh-water limestone to be deposited over a larger area. On the other hand, a major or complete retreat of the ice sheet probably resulted in inundation of the area for a long period, and in deposition of a greater thickness of marine limestone in which were thin, isolated bodies of reworked older material.

The lower Everglades appears to have been a depressed area which, during Pleistocene time, was intermittently shut off from the sea by a barrier along the coastal ridge of southeastern Florida. This barrier was formed by the deposition of the Anastasia formation, the Key Largo limestone, and the Miami oolite. During times of lowered sea level the Everglades lay exposed and contained swamps and fresh-water lakes, and fresh-water limestones were deposited as fills in the lower materials and as beds. The sea level probably was not stable during the glacial stages but rose and fell with relatively short retreats and advances of the ice. Such activity produced thin layers of marine limestone during short sea floodings, interbedded with thin fresh-water or brackish-water deposits during recessions. However, after a complete retreat of the continental ice sheet, the resulting rise of sea level would permit thick marine sections to be deposited. Optimum conditions for the most widespread deposition of fresh-water limestone in the lower Everglades probably occurred at times between the beginning of a glacial stage and of maximum advance of the continental ice sheet. Times of maximum advance of the ice and lowering of sea level were most favorable for channel cutting, resulting in draining of the land.

Correlation of the six postulated beds of fresh-water limestone with specific glacial stages of the Pleistocene is a more difficult problem than the correlation by Parker and Cooke (1944, p. 89) of the beds at the site of old Fort Thompson. The data suggests that the tentative correlation by Parker and Cooke of individual beds with specific glacial and interglacial stages may need revision.

KEY LARGO LIMESTONE

The Key Largo limestone, named and described by Sanford (1909, p. 214-218), is a dead coral reef that makes up the Florida Keys from Soldier Key southwest to Bahia Honda. The Key Largo limestone is a part of the Biscayne aquifer along the coastal area of Dade County. It constitutes the whole of the aquifer in the part of the Florida Keys described. The rest of the Keys southwest from Bahia Honda are composed of the Miami oolite and there the Key Largo limestone may constitute only a small part of the aquifer. The aquifer in the Keys yields saline water to wells.

The Key Largo limestone consists chiefly of recemented reef detritus and precipitated limestone surrounding coral heads of the old reef. The corals were subjected to wave action, which eroded the softer parts and deposited the waste in the openings along with other bioherm material. The formation in general is very permeable, containing solution cavities which were produced in the same manner as in the Fort Thompson formation.

Corals, most of them of the reef-building type, have been found in material from the following wells (fig. 7), at the noted depths:

Well No.	*Depth, in feet below msl*
G 101	20 to 56
G 186	39 to 43
G 189	13 to 32, and 41 to 48
G 193	35 to 43
G 196	41 to 54
G 210	13 to 19
G 216	15 to 20, 24 to 33, and 44 to 60
G 224	18 to 44
G 429	18 to 23
G 448	31 to 40
G 756	56
G 757	44 and 49
G 758	52 and 56
S 986 (and nearby wells)	38, 40, 60, and 70

All except the last four wells, which were cored, were drilled by the cable-tool method. The coralline material in well G 448 directly

overlies fresh-water limestone, whereas in well S 986 a fresh-water lim stone bed at 39 feet is overlain and underlain by reef-limestone materia Coral was noted in wells G 756 and G 757 below the lowest fresh-wat limestone. In many wells that were not cored the coralline limeston appears to be discontinuous, because only a trace of coralline limeston was noted in the samples from wells G 101 and G 224. The comminutio of the material by the bit action prevents any possible indentification o fresh-water limestone in such samples. However, along the eastern pa of the coastal ridge, fresh-water limestones are not apparent in the unde lying limestones and only an occasional bed is penetrated in the wester part of the coastal ridge. The occurrence of coral in the vicinity of th western part of the ridge demarks the area of interfingering betwe the Key Largo limestone and the Fort Thompson formation. The natur of this interfingering is not known nor is the western limit of coralli limestone. An abundance of reef coral was excavated from the borro ditch for the levee which crosses the Tamiami Trail a mile west of Krom Avenue. The corals apparently are from the top part of the Fort Thomp son formation, although it is possible that they are in the Miami oolite als

A great number of wells along the coastal ridge penetrate Pleistocen limestones that apparently include neither fresh-water limestones no coralline limestone. These limestones have been placed in the Anastasi formation.

The upper part of the Key Largo limestone, according to Parker an Cooke (1944, p. 68), interfingers with the lower part of the Miami oolit

ANASTASIA FORMATION

The Anastasia formation was named by Sellards (1912) from its typi cal development of coquina on Anastasia Island, near St. Augustin Florida, and as defined in this report includes all pre-Pamlico marin sand, limestone, and shell beds of Pleistocene age along the coastal are

The Anastasia formation represents the chief component of the Bis cayne aquifer in the vicinity of Fort Lauderdale and along the coasta ridge as far north as Delray Beach in Palm Beach County. In the are to the west, the Anastasia is equivalent to the marine portions of th Fort Thompson formation, and to the south the upper part of the An astasia merges with the Miami oolite and the lower part merges an interfingers with the Key Largo limestone (fig. 9). The formatio is composed of marine sandy limestone, calcareous sandstone, in par coquinoid, and shelly sand. It was initially laid down in a shallow beac environment as an offshore bar which was exposed from time to tim by eustatic sea-level fluctuations during the Pleistocene. An outcrop o

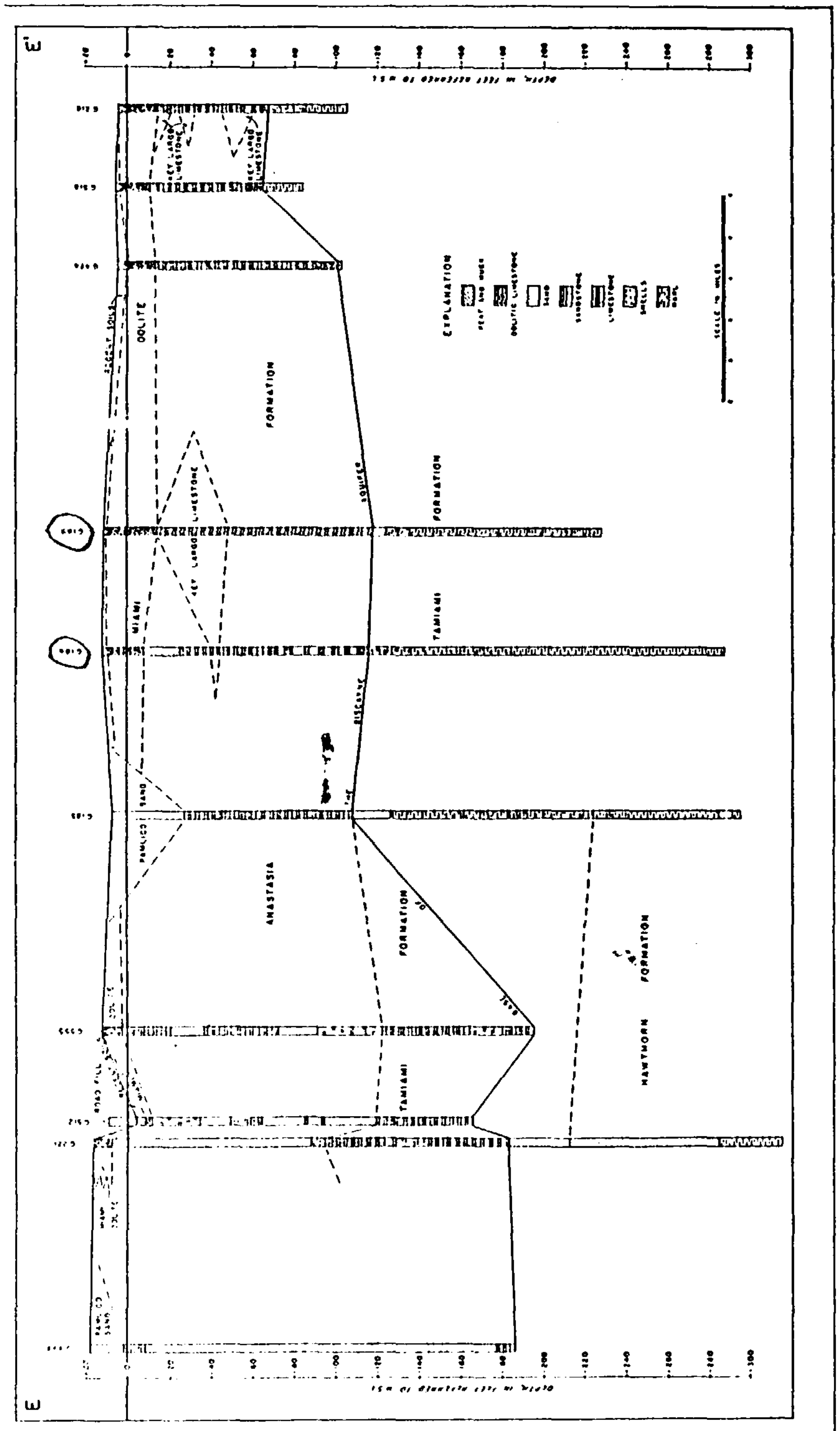


Figure 9. North-south geologic cross section on the coastal ridge.

the Anastasia formation at Palm Beach shows younger eolian crossbedded sandstone lying unconformably on marine calcareous sandstone. The unconformity is characterized by brown sandy soil which fills solution holes in the older material. The Anastasia formation represents sediments deposited throughout all or a major part of the Pleistocene, according to Parker and Cooke (1944, p. 66).

The permeability of the Anastasia formation ranges widely from place to place. Away from the coastal areas, where it is well indurated, ground-water action has produced large solution cavities and the permeability high. Adjacent to the coast the material contains more sand and silt so that the permeability is markedly reduced.

MIAMI OOLITE

The Miami oolite was named by Sanford (1909, p. 211-214). Cooke and Mossom (1929, p. 204-207) redefined the formation to include all the oolitic limestone of southern Florida, including that on the Keys.

The Miami oolite is the surface rock that blankets nearly all of Dade County, parts of eastern and southern Broward County, the southern mainland area of Monroe County, the Florida Keys from Big Pine Key to Key West, and a triangular area extending from Dade County westward along the Collier-Monroe county line. The formation thins out at its western extremity and gradually thickens to the east, attaining a maximum thickness of about 40 feet.

In the lower Everglades the Miami oolite unconformably overlies and fills cavities in the upper surface of the Fort Thompson formation. Along the coast the formation interfingers with the upper portions of the Fort Thompson, Anastasia, and Key Largo formations. Where not exposed at the surface in the lower Everglades, it is covered by Recent organic materials. In northwest Dade County and southwest Broward County, it is overlain unconformably by the Pamlico sand, a terrace deposit of Pleistocene age, or by the Lake Flirt marl of Pleistocene and Recent age.

The Miami oolite is typically a white to yellowish massive crossbedded oolitic limestone containing varying amounts of sand, usually in solution holes. Where exposed to weathering, as in the Silver Bluff area, the surface of the oolite turns a dull gray color. Crossbedding and cone-in-cone structures are outstanding features. The angle of dip of the crossbedded material changes from place to place, and the material is apparently a dune or beach-ridge deposit. The high angle crossbeds in places are beveled by flat-lying oolitic material containing marine shells. In the Silver Bluff area large pieces of crossbedded oolitic limestone are incorporated in portions of oolite which show no evidence of bedding. This is definite evidence of reworking of younger oolite deposits and, according to Parker and Cooke (1944, p. 71), might indicate either that the Miami oolite represents deposits of two or more interglacial stages or that the deposition, reworking, and redeposition occurred during a single stage. In either case, oscillation of the sea level was involved. At many places in Broward County the formation is composed almost entirely of calcareous oolitic sand or of mixtures of calcareous and quartz sand.

PAMLICO SAND

The Pamlico sand is a late Pleistocene terrace deposit of marine origin (Parker and Cooke, 1944, p. 75). Parker and Cooke (p. 74, 75) extended the term Pamlico sand from North Carolina to southern Florida, and defined it to include all the marine Pleistocene deposits younger than the Anastasia formation.

The Pamlico sand blankets much of the Everglades north of the latitude of Fort Lauderdale and covers the coastal area as far south as Coral Gables. It unconformably overlies and fills cavities in the Miami oolite, the Fort Thompson formation, and the Anastasia formation. In the northern part of the region the sand is covered by Recent marls and organic soils.

The Pamlico sand is chiefly a quartz sand ranging in color from light gray or white to red and gray-black, depending on the amount of incorporated iron oxide or carbonaceous material. In localities where shells are admixed, the Pamlico sand may be semiconsolidated as a result of solution and redeposition of calcium carbonate. The quartz sand ranges in size from very fine to coarse, the medium-sized grains predominating. Where the material is medium to coarse, and well sorted, it will furnish adequate fresh-water supplies for domestic purposes.

is used by plants, another portion runs off as surface water, in streams or to fill lakes and ponds, and the remainder percolates rapidly through the thin sandy mantle to the water table. Only in the Everglades does any major surface runoff occur.

The water table is the upper surface of the zone of saturation except in areas (rare in southern Florida) where that zone is formed by an impermeable body. The water table is open to the atmosphere and is marked by the level at which water stands in wells. It is an undulating surface which in a general way conforms to the topography, being at higher elevations under hills and lower under valleys. The water table in the Biscayne aquifer normally lies within the Miami oolite, the Pamlico sand, or the organic soils of Recent age. Parker (in Parker and others 1955), in relating precipitation to water-table rises, estimates that about two-thirds of the annual rainfall reaches the water table in southern Dade County.

The water table fluctuates in response to local rainfall in the area and to natural discharge (seepage into streams or canals or to the sea and evapotranspiration), and pumping.

Water for small domestic supplies is derived through small diameter sand-point wells from the Pamlico sand. The Miami oolite is more permeable than the Pamlico sand, and the contained water is obtained by means of shallow open-hole (unscreened) wells. Large supplies of water are obtainable from uncased wells in this formation in the grove area of southern Dade County. The Key Largo limestone, the Anastasia formation, and the Fort Thompson formation in Dade County will yield large amounts of water to open wells. For example, an 18-inch well southwest of Miami yielded 7,600 gallons per minute, or about 11 million gallons a day, with a drawdown of only 7 feet. Along the coastal areas of Broward County, the water in the Anastasia formation generally is obtained by means of screened wells. At Fort Lauderdale the Tamiami formation which is a friable very calcareous sandstone yields large quantities of

19

CONVERSATION REC

Reference 13

File Name: VINYLEX

Date: 11/17/88

Contact Person: Bob Quevas Chief Engineer Miami Dade Water and Sewer

Time: 9:30 am

Phone No.: (305) 665-7471

From: Jim McCarthy

Subject: Status of Miami-Dade Water and Sewer wellfields

TO: Eric Nuzie

The Hialeah and Miami Springs wells that supply water to the Hialeah and Preston Water Treatment Plants are used on an intermittent basis due to VOC contamination. These wells supplement water from the Northwest and Southwest well fields in Western Dade County.

Hialeah Water Treatment Plant (WTP) receives:
- Northwest well field (continuous)
- Miami Springs wells (intermittent)
- Hialeah wells (intermittent)

Preston Water Treatment Plant (WTP) receives
- Northwest well field (continuous)
- Miami Springs wells (intermittent)
- Hialeah wells (intermittent)

Alexander Orr WTP
- Southwest well field (continuous)

TO Honorable Mayor and Members
Board of County Commissioners

DATE February 15, 1983

SUBJECT Amendment to Cone of Influence Maps

FROM M. R. Stierheim
County Manager

83-17

RECOMMENDATION:

It is recommended that the Board approve changes to the Cone of Influence maps, specifically those wellfields listed below:

Miami-Dade Water and Sewer Authority

Northwest	Alexander Orr	Snapper Creek
Southwest	John E. Preston	Hialeah
Miami Springs Lower	Miami Springs Upper	South Miami Heights
Leisure City	Naranja	Newton
Medley	Elevated Tank	Everglades Labor Camp

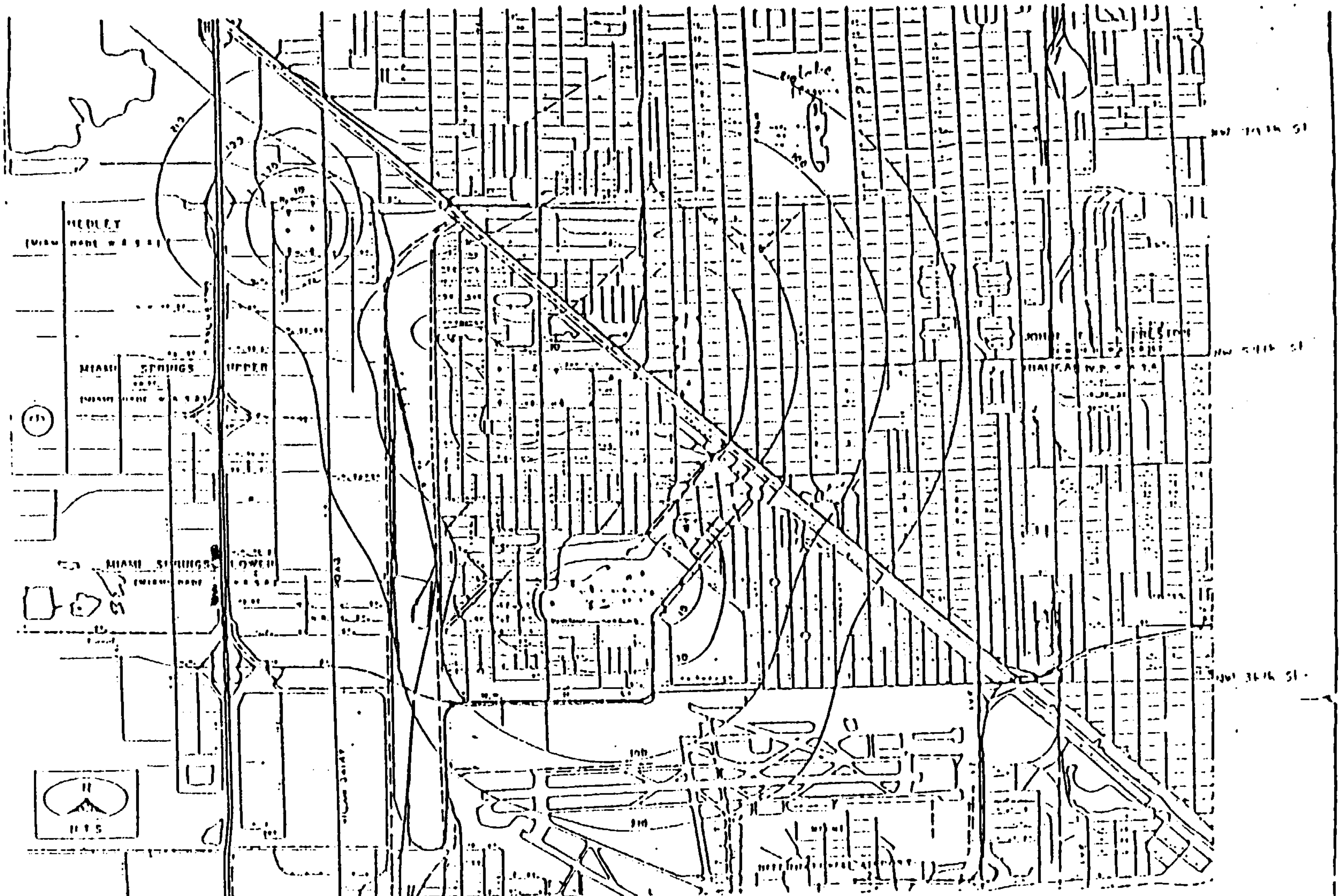
City of North Miami Beach

Sunny Isles East Dr.	W.A. Oeffler	Myrtle Grove

City of North Miami	Westside	
Southern Gulf Utilities	Riverdale	
City of OpaLocka	OpaLocka	
Dade Utilities	Mansionette	
South Dade Utilities	Point Royale	Belaire
Florida Keys Aqueduct Authority		Florida Keys Aqueduct
Homestead Air Force Base	Homestead Air Force Base	
City of Homestead	Wittkop Park	Harris Park
City of Florida City	Florida City	

TABLE OF CONTENTS

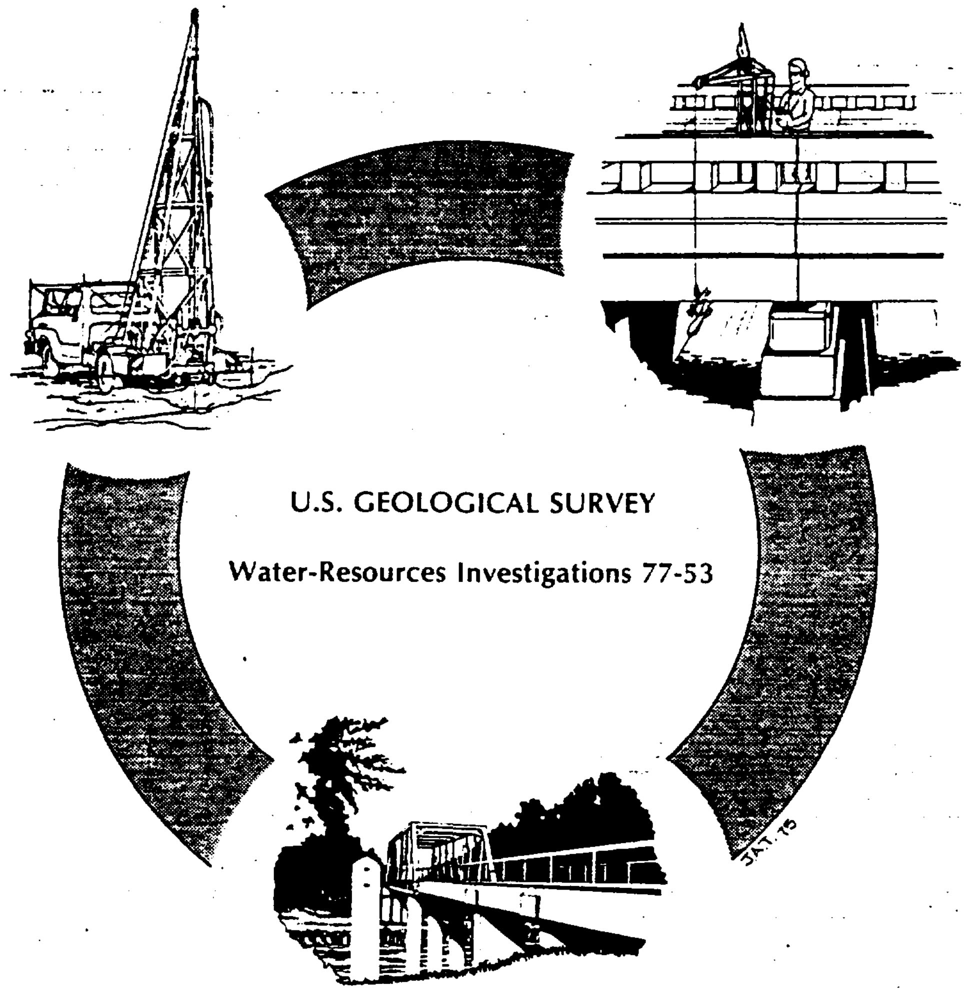
Note: Asterisk (*) denotes stand-by facilities


MIAMI SPRINGS UPPER
MIAMI SPRINGS LOWER

PUBLIC WATER SUPPLIES

MUNICIPALITIES IN FL

Reference 14



U.S. GEOLOGICAL SURVEY

Water-Resources Investigations 77-53

Prepared in cooperation with
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
SOUTH FLORIDA WATER MANAGEMENT DISTRICT
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
SUWANNEE RIVER WATER MANAGEMENT DISTRICT
NORTHWEST FLORIDA WATER MANAGEMENT DISTRICT
AND OTHER STATE, LOCAL, AND FEDERAL AGENCIES

Reference 15

Dangerous Properties of Industrial Materials

Sixth Edition

N. IRVING SAX

Assisted by:

Benjamin Feiner/Joseph J. Fitzgerald/Thomas J. Haley/Elizabeth K. Weisburger

VNR VAN NOSTRAND REINHOLD COMPANY

New York

March 28, 1988

Mr. Roger E. Carlton
United States Environmental
Protection Agency
Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Mr. Carlton:

Please, add the following site to ERRIS.

Dade East Plant
1851 Delaware Parkway
Miami
Dade County, FL 33125

Corresponding Site and Event Maintenance Forms are attached.

Please, call me if you need additional information.

Craig F. Feeny
Environmental Specialist II
Bureau of Waste Cleanup

CFF/mlr

Attachment

OFFICE OF EMERGE...
C E R C L A
M.2 - SITE MAINTENANCE FORM

SOURCE: -

...ME: Dade East Plant CONG DIST: 19

...: 1851 Delaware Parkway ZIP: 33125-

Miami CNTY CODE: 025

...AME: Dade

...E: 25/47/33.0 LONGITUDE: 080/14/43.0

HYDRO UNIT: --------

...RY IND: Y REMEDIAL IND: Y REMOVAL IND: N FED FAC IND: N

...: - NPL LISTING DATE: --/-- NPL DELISTING DATE: --/--

...M: --- SITE CLASS: --

...ILL IDS: -- -- -- -- --

...ME: RPM PHONE: ---·---·----

TIER: ---- REG FLD1: ------ REG FLD2: -

...RM: PENDING (_) NO FURTHER ACTION (_)

...SP: NO VIABLE RESP PARTY (_) VOLUNTARY RESPONSE (_)

ENFORCED RESPONSE (_) COST RECOVERY (_)

...SCRIPTION:

Some drums drained trichloroethylene into on-site soil (1973).
Lyophilizer failure also resulted in a release of
trichloroethylene into the soil (1973). A recent investigation
showed shallow groundwater contamination by trichloroethylene.

P...

CPF/...

Attach...

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF EMERGENCY AND REMEDIAL RESPONSE
C E R C L A

M.2 - EVENT MAINTENANCE FORM

ON: _

Dade East Plant

RAM: ______________________________

ID: ____________ PROGRAM CODE: HØ1 EVENT TYPE: DS

CODE: _ EVENT QUALIFIER: ___ EVENT LEAD: S

NAME: ______________________________ STATUS: _

RIPTION:

____

____

____

____

RIGINAL	CURRENT	ACTUAL
T: __/__/__	START: __/__/__	START: 03/29/88
: __/__/__	COMP : __/__/__	COMP : __/__/__

OMMENT:

____

OMMENT:

____

AGR #	AMENDMENT #	STATUS	STATE X
------	----------	--	---